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REPORT

ON THE

SCIENTIFIC RESULTS

OF THE

VOYAGE OF H.M.S. CHALLENGER

DURING THE YEARS 1873-76

UNDER THE COMMAND OF

CAPTAIN GEORGE S. NARES, R.N., F.R.S.

AND

CAPTAIN FRANK TOURLE THOMSON, R.N.

PREPARED UNDER THE SUPERINTENDENCE OF

THE LATE

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ZOOLOGY—VOL. X.

PART XXVII.—REPORT ON THE MYZOSTOMIDA

BY DR. L. VON GRAFF

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The Zoology of the Voyage of H.M.S. Challenger.

PART XXVII.

REPORT ON THE MYZOSTOMIDA.

By Dr. L. von GRAFF, Professor of Zoology in the College of Forestry, Aschaffenburg, Bavaria.

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THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the MYZOSTOMIDA collected during the Voyage of H.M.S. Challenger during the years 1873–76. By Dr. L. VON GRAFF, Professor of Zoology in the College of Forestry, Aschaffenburg, Bavaria.

PREFACE.

IN this Report sixty-eight species of Myzostomida are enumerated, of which fifty-two appear here for the first time. The Report includes, in addition to the specimens collected by the Challenger Expedition, all the new material which I have been able to gather together since the publication of my Monograph on the genus *Myzostoma*.[1] I am indebted to the editor of the Challenger publications, as well as to those who have kindly furnished me with collections, for the permission, in the interests of science, to collect all the information into the present memoir. I am specially indebted to Mr. P. Herbert Carpenter, through whom I have received fifty new species. He, at my request, and with a readiness which cannot be too highly appreciated, looked for and sent me, with all the information necessary, the specimens of *Myzostoma* not only from the Challenger collection of Crinoidea, but also from the many others which he has examined during the past few years. The following shows the principal sources from which I have obtained the specimens described in the memoir, and I take this opportunity of conveying my thanks to the gentlemen who have so generously placed collections in my hands for examination and description.

1. Challenger Expedition.
2. Dredging Expedition of the U.S.S. "Corvin," "Bibb," "Hassler," and "Blake" (Mus. of Comp. Zool., Harvard College, Cambridge, Mass., Prof. A. Agassiz).

[1] Das genus Myzostoma, mit 11 Tafeln., Leipsic, 1877.

3. The Copenhagen Museum (Dr. Ch. Lütken).
4. The Kiel Museum (Prof. K. Möbius).
5. The British Museum (Dr. A. Günther and Prof. F. Jeffrey Bell).
6. The Dutch Arctic Expedition of S.S. "Willem Barents," 1880–1881 (Kon. zool. Genootschap Nat. Art. Magistra, Amsterdam).
7. The Norwegian Arctic Expedition (Bergen Museum, Dr. A. Hansen).
8. The Leyden Museum (Prof. A. A. W. Hubrecht).
9. The private collections of Messrs. P. H. Carpenter, A. Agassiz, K. Möbius, E. Hæckel, and J. W. Spengel.

The most abundant and interesting material was obtained from Nos. 1–4.

I have indicated roughly the locality and also quoted the number of the Stations at which the different species collected during the Challenger and "Blake" Expeditions were found, since all the details are contained in the published lists of Stations of these two expeditions[1]; moreover, the geographical distribution of the Myzostomida being connected with that of their hosts, the Report on the Crinoidea, shortly to be published, will furnish the necessary information.

The names of the hosts new to science were communicated to me by Mr. Herbert Carpenter from his MSS. Finally, I wish to state that, following the suggestion of Dr. v. Willemoes Suhm,[2] I examined the figures of fossil Crinoidea in palæontological literature, as well as the actual fossils contained in the Munich collection, in order to find out, if possible, traces of Myzostomida, and was rewarded by discovering the cysts of the parasites upon the stalks of fossil *Pentacrini*. I intend to continue these investigations, and should feel very grateful if those gentlemen who have at their disposal collections of fossil Crinoidea would be so kind as to inform me if they notice any appearances like those drawn on Pls. XI–XV. of this work.

Aschaffenburg, *October* 1, 1883.

[1] Appendix to the Introduction to the Zoological Reports, Zool. Chall. Exp., vol. i.; also, Narrative of the Cruise, vol. i.—List of Dredging Stations occupied by the United States Coast Survey Steamers "Corvin," "Bibb," "Hassler," and "Blake," from 1867 to 1879. Benjamin Pierce and Carlile P. Patterson, Superintendents of the Coast Survey, *Bull. Mus. Comp. Zool.*, Cambridge, Mass., vol. vi., No. 1, 1879.

[2] Von der Challenger Expedition, Brief VI., *Zeitschr. f. wiss. Zool.*, Bd. xxvi., 1876, p. lxxix.

INTRODUCTION.

The present Report, unfortunately, does not fill up all the many deficiencies in histological detail left in my former Monograph on the genus *Myzostoma*. This is owing partly to the fact that the material at my disposal was not in a very first-rate condition for minute anatomical research, and partly to the small number of specimens of many of the species—sometimes only one or two—which, of course, prevented me from using them for histological investigation. Although this Report is on the whole chiefly systematic, it will, I hope, be found to further our knowledge of the group in the following respects:—

1. It shows that the Myzostomida do not form such a uniform group as was formerly thought, either in structure or in mode of life.
2. The numerous new species render more intelligible the structure and arrangement of the various organs of the body, which is of assistance in fixing the boundaries of species.
3. Several of the new species throw considerable light upon the affinities of the group.

In order to render this Report more complete, I shall give, in the description of species, a short account of all the species already known, but not contained in the collections that I have in my hands at present.

The following is a brief account of the structure of *Myzostoma*, as far as it is known at present.

The body (fig. 1) is a circular disk, provided along the margin with ten pairs of digitiform processes. On the ventral side, arranged in two semicircles, are five pairs of non-articulate foot-stumps (parapodia), in the intervals between which, and nearer the margin, are four pairs of suckers; at the end of each of the parapodia is a bent pointed hook supported by a straight rod, which in order to guide the hook is furnished at its extremity with a bent end-plate (manubrium) and several smaller hooks. The whole apparatus is capable of extension and retraction by means of a complicated system of muscles radiating outwards from a central ventrally placed muscular mass. Close to the anterior end of the ventral surface is the mouth, and close to the posterior end is the aperture of the cloaca. The alimentary canal consists of a muscular pharynx, which can be extruded through the mouth, of an œsophagus separated by a valve from the stomach, which is itself separated by a circular fold from the terminal portion of the canal—the rectum; from the stomach a number of branched radiating cæca take their origin. Beneath the stomach is the large

oblong central nervous system, which gives off anteriorly a commissure surrounding the pharynx.

The sexual organs are hermaphrodite. The female organs consist of a number of ovarian cæca, dorsal in position ; they open into the cloaca by a central uterine tube. The testes are usually ventral in position, and ramify on either side of the stomach ; the cæca

FIG. 1.—Diagram of the Structure of *Myzostoma*.

C_1-C_{10} the 10 pairs of cirri; *Cl*, cloacal opening; *i*, intestine; *M*, mouth; *N*, central nervous system (blue), with *n*, *n*, œsophageal ring; *ov*, ovarian tubes (yellow); P_1-P_5, the five pairs of parapodia; *Ph*, protruded pharynx; *R*, the rectum; S_1-S_4, the four pairs of suckers; *t*, testicular follicles; *U*, opening of the uterus into the rectum; *V*, stomach; ♂ the two lateral male genital openings.

unite on either side into a spermatic vesicle, which opens to the exterior between the third parapodium and the margin of the body.

The above description, with a few unimportant modifications, applies to all the species known up to the present time. I shall now show how far our knowledge of the anatomy of the group has been advanced by the new forms to be described in the present Memoir.

GENERAL MORPHOLOGY OF THE BODY.

Form of the Body.

All the Myzostomida hitherto known are characterised by the peculiar radial arrangement of the organs of the body. Corresponding to its disk-like form, we find the ten parapodia situated at pretty equal distances from each other, so that the whole body is divided into ten regular "parapodial sectors"; on the boundary lines between each of these are the eight suckers, the oral and the cloacal apertures. The sectors are separated inside the body by an equal number of radially arranged muscular septa, which thus form a number of similar compartments. The same radial arrangement is seen in the muscles of the hooks, especially in the strong musculi centrales, which unite in the middle of the body in a large muscular mass. In certain species where the axis of the body becomes lengthened, and so disturbs the circular arrangement of the suckers and parapodia, the radial character is nevertheless retained by the compartments, each corresponding to a single parapodium.

In the present Report several species will be described in which this radial arrangement is entirely lost; in some cases (*Myzostoma folium*) the body is greatly lengthened and the parapodia and suckers are situated in two parallel lines, while in the new genus *Stelechopus* not only has the external radial symmetry disappeared, but the muscular septa and the muscles of the parapodia are no longer convergent. In *Stelechopus* the septa are situated one behind the other at right angles to the axis of the body, running from the body-wall to the intestine, and the parapodia show the same bilateral symmetry, and their muscles are not united into a central muscular mass (Pl. XVI. fig. 1). If, as I have already[1] tried to prove, the radial arrangement of the musculature is indeed an adaptation to the mechanism of fixation, the want of this radial arrangement in *Stelechopus*, which undoubtedly moves about freely, must be regarded as the primitive arrangement.

Myzostoma glabrum has been until now the only exception to the general rule that the apertures of the body, as well as the parapodia and suckers, are situated upon its ventral surface; in this species the cloacal aperture is dorsal. I shall have in the present Report to describe two new species (*Myzostoma pulvinar* and *Myzostoma calycotyle*) in which the oral and cloacal apertures are upon one side of the body, while the parapodia and suckers are upon the other. If the parapodia alone be not sufficient to determine that

[1] *Loc. cit.*, p. 44.

to be the ventral surface of the body, the presence of the central nervous system conclusively proves it to be so, since this structure, as already stated, lies between the ventral muscular mass and the ventral wall of the body; in this way the opposite side of the body bearing the mouth and cloacal aperture must be regarded as the dorsal surface, since the intestine never lies below but always above the central muscular mass.

The two European species—*Myzostoma glabrum* and *Myzostoma cirriferum*—though they by no means represent the two extremes of the series, exemplify two groups which differ from each other in another respect. In the one the body is stout and massive and of a solid consistence; the back is usually vaulted; as a rule there are no cirri, or they are, if present, represented by short inconspicuous processes; the ventral surface is bulged out by the strongly developed muscular mass, and from this central elevation a number of smaller ridges run to the bases of the parapodia, and between them still smaller ridges connect the central elevation with the suckers. These ridges appear to be produced by the muscles of the parapodia—especially the musculus centralis—and the suckers; two other ridges, one running forwards and the other backwards, correspond to the pharynx and cloaca. On the dorsal surface one sees very often five pairs of feeble elevations, which mark the position of the base of the hook-apparatus, and in *Myzostoma testudo* become very much enlarged. Sometimes (*Myzostoma costatum*) the whole intestine shows itself on the outside, in the form of a series of elevated ridges.

In the other group the body is thin, flat, membranous, and somewhat transparent, with a more highly transparent marginal border, which is owing not merely to the slighter development of the muscles, but to the fact that the ramifications of the intestines and genital glands do not quite extend to the periphery of the animal (fig. 1). The greater delicacy of the body in this group is owing to the slighter development of the muscles of the body, especially of the ventral muscular mass; but the presence of a more transparent marginal border is not confined to these forms. The second group is also characterised by the possession of long cirri or cirrus-like processes of the margin of the body. The number of these is not limited to twenty, but occasionally exceeds that number.

There are, it is hardly necessary to say, numerous transitional forms, which unite the two groups, and can be with difficulty assigned to either; among these are the very remarkable forms distinguished by the possession of two, four, or six finger-like caudal appendages such as *Myzostoma lobatum* and *Myzostoma fissum*.

Colour and Sculpturing of the Skin.

As might be expected, the group containing the larger and stouter forms displays most variety in colour and sculpturing, though only on the dorsal surface—the ventral surface being always of a uniform dull yellow or brown. The second group are nearly all yellow or brown—the prevailing colour of the Myzostomida—with a somewhat lighter coloured

marginal border. The larger forms occasionally exhibit a pattern of two colours on the dorsal surface, as may be seen in the figures of *Myzostoma glabrum*,[1] *Myzostoma horologium*, *Myzostoma rubrofasciatum*, and *Myzostoma pictum*.[2] The first two species, the only ones of which I had abundant material, show at once how greatly the colour varies, and how unsafe it is therefore to fix the limits of a species by its colour. And this is owing to variations in the living animals and not merely to the fact that they are mostly known only by spirit specimens, in which case it is impossible to decide how much of the colour belongs to the *Myzostoma* itself, and how much is caused by the alcohol which contains the dissolved pigment of its host.

The dorsal surface is sculptured only in the larger specimens of the genus, which are also, as already mentioned, often distinguished by large elevations and ridges on the surface of the body. This sculpturing, when present, takes various forms: in *Myzostoma echinus* the dorsal surface is covered by fine folds (Pl. II. fig. 29); sometimes the skin is divided by longitudinal and cross furrows into a number of variously sized polygonal areas —minute in *Myzostoma coronatum* (Pl. III. fig. 9) but larger and separated by deeper furrows in *Myzostoma areolatum* (Pl. III. fig. 1); a third variety is shown by *Myzostoma gigas*, *Myzostoma longipes*, and *Myzostoma marginatum* (Pl. II. figs. 3, 24, and 16), where the skin is covered by a quantity of small tubercles pressed close together or separated by intervals into larger and smaller groups. The tubercles may be of equalsize, only diminishing slightly towards the border, or of very different dimensions; occasionally the tubercles become so minute and close that the skin acquires a granular appearance; on the other hand, these tubercles are sometimes highly developed, and arranged in radial lines (*Myzostoma echinus*, Pl. II. fig. 29).

In judging of the species by its sculpturing, it is always important to ascertain whether or not the animal was removed from its host before being plunged into alcohol, for in the former case it will be more bent towards the ventral side, and the dorsal surface will therefore be strongly projecting. All these circumstances evidently must considerably modify the sharpness of the sculpturing.

Cirri.

These structures are solid continuations of the integument, provided at their extremity with stiff setæ, and with a ventral furrow containing protrusile glutinous cells ("Klebzellen"); so the cirri serve not only as organs of attachment but also as tactile organs, as I observed in the case of *Myzostoma cirriferum* (*loc. cit.*, p. 29). Möbius also remarks that *Myzostoma mœbianum* used its cirri in locomotion, for clinging to the pinnules of its host (see special description of this species). The caudal appendages of certain other species of *Myzostoma*, already mentioned, differ from these cirri in being hollow and

[1] Genus Myzostoma, pl. i. figs. 1–11. [2] This Report, Pl. I. figs. 4–14; Pl. II. fig. 32; Pl. II. fig. 22.

containing prolongations of the intestinal cæca and generative glands. There exist, however, a number of transitional forms, which prove that these caudal appendages are merely peculiarly modified cirri; in several species (*Myzostoma filicauda*, *Myzostoma filiferum*, *Myzostoma quadrifilum*, *Myzostoma intermedium*) the caudal appendages are only hollowed out at the base, while the apical portion closely resembles a cirrus. In the last-mentioned species (Pl. IV. fig. 2) a transition is seen between the cirri and the caudal appendages, the outermost pair of which resemble the cirri far more closely than the inner pair. In *Myzostoma brachiatum* (Genus Myzostoma pl. ii. fig. 2) the cirri resemble the caudal appendages in being situated ventrally; the intestinal cæca, moreover, penetrate the bases of the larger cirri for a short distance, although in other respects they agree in structure with the small cirri; if the branches of intestine were to occupy the whole of the cirrus, it would become exactly similar to a caudal appendage. There is little doubt, therefore, that the two structures are homologous, and that both have the same conditions of growth. In consequence of which it may be that the size of the caudal appendages, as well as their presence or absence, and the length of the terminal threads, is only a sign of difference of age—as far as these conditions are proportionate to the size of the animal examined. But also the number of the caudal appendages is of doubtful value as a diagnostic character if we consider more closely the number of the true cirri.

By investigating individuals of various ages and species, and comparing all the forms that bear cirri, it is clear that with regard to the number present there are primarily two groups to be distinguished:—(1), those that possess from the very first ten pairs of these organs which do not subsequently increase in number; and (2), a second group in which their growth is unlimited, new lateral cirri appearing between the ten original ones. I am not able to state with certainty, from my examination of the material at my disposal, whether the growth of lateral cirri is at all limited, and whether there is any order or regularity of sequence in the appearance of the new ones. In any case there may be at length species in which the margin of the body is so covered that there is absolutely no room for any more (Pl. X. of this Report, and Genus Myzostoma, pl. x. fig. 1). There are but rarely less than ten pairs of cirri, if these organs be present at all; the encysted *Myzostoma tenuispinum* (Pl. XIII.), and *Myzostoma willemoesii* (Pl. XIV.), however, have only seven pairs. Besides the cirri there are in one species—*Myzostoma fimbriatum* (Pl. VI. figs. 5, 6)—bunches of fine threads along the margin of the body, which probably serve as tactile hairs.

Parapodia.

The parapodia have been already discussed, in so far as they influence the symmetry of the body. In some of the new species there is a new form of parapodium, in which the terminal portion is not a tube from the extremity of which protrude the hooks, but has

the form of a groove, rendering the hooks visible along their whole length (*Myzostoma wyville-thomsoni*, Pl. VI. fig. 1). The parapodium is thus divisible into two parts,—a larger basal portion, completely enclosing the hook-apparatus, and a grooved terminal portion. This form of parapodium is the extreme of a series which commences as a single wart-like prolongation, and then in correspondence with the development of the ventral muscular mass, shows a more or less distinct division into two parts, which becomes more and more marked.

In the description of species the distance of the parapodia from the margin of the body is given; this distance varies greatly, inasmuch as the parapodia are sometimes on the very edge of the body and sometimes crowded together at its centre; the point of insertion is often difficult to fix, since it is only marked distinctly on the external side of the parapodium, and ends on the inside in a centripetal elevation formed by the musculus centralis.

Hook-apparatus.—The two portions of this apparatus—the pointed hook (*uncinus*) and the supporting rod (*manubrium*) provided with a terminal end plate to direct the movements of the first—I have shown (*loc. cit.*, pp. 32, 33) to vary considerably in form according both to the species and the age of the individual examined. My recent investigations lend additional support to this statement, and I have not therefore paid much attention to these structures in fixing the species, especially as I was unable of course to mutilate unique specimens in order to examine them closely enough. The manubrium and the other parts of the hook-apparatus may fluctuate very widely in respect of structure and proportions in the parapodia of one and the same individual (*e.g.*, *Myzostoma horologium* and *Myzostoma gigas*).

The parapodia of the Myzostomida Cysticola become insignificant wart-like structures, and in the female of those species in which the sexes are separate there is no trace of the parapodia remaining, save a very feeble hook-apparatus, the muscles of which are very much reduced. It appears also that the column of the hook and manubrium are not, as I formerly thought, hollow, but in many species at least solid. When the hooks of *Myzostoma horologium* are treated with strong potash, the manubrial plate loses its refractive power, and nothing remains but a finely granular organic basis (Pl. I. fig. 17); then the column begins to flake, peels off in concentric layers, and there remains at length a central rod of a firmer consistency, which is only destroyed after being subjected for a longer time to the influence of the reagent. The same phenomena were observed in the large hooks of *Myzostoma gigas* (Pl. II. fig. 4).

Suckers.

It is interesting to find that there are some forms entirely unprovided with suckers, as, for instance, *Stelechopus* and many species of *Myzostoma* (*Myzostoma pulvinar*, *Myzostoma folium*, *Myzostoma coronatum*, *Myzostoma carinatum*, and all the encysted

Myzostomida except *Myzostoma willemoesii*). It would be desirable, however, to place this beyond a doubt by the help of sections, since it is always possible that (except in *Stelechopus* and the encysted species) there may be microscopic rudiments of suckers remaining; and, on the other hand, it is possible that certain cavities on the ventral surface of many species do not really represent suckers at all, as they were formerly supposed to do. It seems also the limit of the suckers and their appearance generally varies according to the different state of contraction in which they are.

The shape and arrangement of the suckers is also of importance for classificatory purposes. In *Myzostoma calycotyle* (Pl. III. figs. 25, 26) there are stalked suckers, which have a very singular relation to the parapodia, being situated quite close to their external sides, commencing from the middle line of the body. The general rule is that they occupy the middle of the interval between two parapodia.

Alimentary Canal.

I have already spoken of the general configuration of the alimentary canal, and its influence on the outer form of the body. It remains to be stated that there are species (*Stelechopus*) in which the alimentary canal, instead of being ramified and divided into stomach, intestines, &c., is simple and straight, with only feeble indications of lateral branches. This peculiarity, accompanied as it is by other important variations from the typical structure, is of great use for systematic purposes.

Generative Organs.

The suggestion made by v. Willemoes Suhm that some Myzostomida were in all probability dicœcious, has been amply verified by my investigations, and I have also to add to our knowledge of the group many facts concerning the structure and disposition of the organs themselves. The following is a general account of the structure of these organs, leaving out the genus *Stelechopus*, which is but imperfectly known. The cloacal aperture is situated on a papilla, and is the common opening for the rectum and oviduct. The male sexual openings are two, corresponding to the number of the testes; they open on the ventral surface of the body, one on each side, between the third parapodium and the margin of the body. The apertures are sometimes simple, but sometimes their borders are prolonged into a tube-like continuation which is very contractile, and may assume therefore very different shapes even in the same species. The male apertures are absent, or only present on one side in the Myzostomida Cysticola, which is owing to the fact that the testes in this group are either absent or unilaterally developed.

Sexual Organisation of the Myzostomida Cysticola.

Von Willemoes Suhm[1] discovered, to his astonishment, that the individuals contained in a single cyst either resembled each other in form and size, or were very different, and concluded, though without having been able to examine the sexual organs, that in the latter case the individuals resembled *Distoma okenii*, in that one had the male organs especially developed, and the other the female organs.[2] I am able to state that this is really the case, that each individual is either male or female, and that in addition the two sexes are unlike in appearance, the female being usually 50–100 times as large as the male. That these forms (*Myzostoma tenuispinum*, *Myzostoma willemoesii*, *Myzostoma inflator*, *Myzostoma murrayi*) are originally descended from androgynous forms, in which the organs of one sex have become gradually abortive, is shown by the case of *Myzostoma cysticolum*, in the female of which there are rudiments of the testes, but no male generative aperture (Pl. XIII. fig. 4, *t*). These dicœcious forms are also distinguished by the marginal position of the sexual apertures, both male and female (Pls. XIII. and XIV.), and the form of the testes in the males. In *Myzostoma willemoesii* and *Myzostoma inflator* alone, which resemble the free living forms in the possession of twenty long cirri, the testes have the typical ramified form; in all the others they are compact roundish glands occupying definite areas in the lateral part of the body.

In those forms in which the individuals inhabiting one cyst are not different in appearance, the sexual organs have a different structure; each individual is here androgynous, but differs from the free living androgynous species in that the testis is developed only on one side of the body, and there is but one male genital aperture; in *Myzostoma pentacrini*, however, there are small remnants of the other testis, but no second male aperture. The testis also, as in the dicœcious forms, is a small compact gland. Since the testes of the dwarf males are fully developed on both sides, we must not regard the hermaphrodite species, *Myzostoma pentacrini* and *Myzostoma deformator*, as transitional between the typical hermaphrodite forms and those that are dicœcious, but the latter must be derived independently from the free-living forms.

More abundant materials are required before the question about the life history of the Myzostomida Cysticola can be definitely answered, but my investigations permit me to state that the following view is in all probability correct.

The male and female being found associated in a common cyst, and increasing in size with the growth of the cyst, shows that they perforate the arm-joints or pinnules of their host together. The growth of the cyst is of course caused by the presence of the parasite; the female deposits her eggs within the cyst, and the young embryos, after they

[1] Von der Challenger Expedition, Brief III., *Zeitschr. f. wiss. Zool.*, Bd. xxv., 1875, p. xxxi., and Brief VI., Bd. xxvi., 1876, p. lxxix.

[2] "Dass auch hier (wie bei *Distoma okenii*) das eine Thier sich namentlich für die männliche, das andere für die weibliche Thätigkeit entwickelt."

have abandoned the cyst and lost their ciliated coat, associate together in pairs, and bore their way through the arm-joints. In both the sexual development begins with the appearance of testes (*cf.*, *Myzostoma brevicirrum*, p. 43), but in the female the testes degenerate and disappear entirely, or leave but a minute rudiment (*Myzostoma cysticolum*), when the ovaries make their appearance in addition. The curious shape of the female—convex below and flat or concave above—is owing to the growth of the cyst, whose sides rise round the parapodia and press the lateral parts upwards.

Among the hermaphrodite forms, *e.g.*, *Myzostoma pentacrini* and *Myzostoma deformator*, it is impossible to say anything for certain about the relations between the individuals enclosed in one cyst. As three, two, and sometimes only a single individual are found in a cyst, it is evident that self-fertilisation must sometimes occur; and the fact that when more than one individual is found in one cyst they are separated by partitions to a smaller (*Myzostoma deformator*) or larger (*Myzostoma pentacrini*) extent, tends to show that it is the rule. In this case, therefore, it is by no means necessary that several individuals should be associated together in a common cyst, and the occurrence must be regarded as accidental.

Relation of Myzostomida *to their Host.*

The Myzostomida Cysticola are interesting to the zoologist and palæontologist, not only from their structure but also from the cysts they produce, which recall plant galls. Under the description of species, a detailed account of these structures and the frequency of their occurrence will be given. I may here briefly allude to the most important facts. The effect of the free-living Myzostomida on their host I have already discussed in my former Monograph, but I will add that I lately received from Naples, through the kindness of Dr. Spengel, a specimen of *Antedon rosacea*, bearing numerous examples of *Myzostoma cirriferum* upon its arms, and not less than sixteen large specimens of *Myzostoma glabrum* upon the disk.

Myzostoma asymmetricum is somewhat transitional between those forms that crawl freely about their host and those that are encysted. It is found attached to the ventral surface of the pinnules, which becomes slightly enlarged by the contact of the parasite, as does also the proximal arm-joint (Pl. XI. figs. 4–6). *Myzostoma willemoesii* causes a more marked malformation (Pl. XIV. figs. 6, 7); it is attached to the ambulacral surface of the pinnule, the joints of which become larger and more hollowed out, forming thus a canal; the whole pinnule is wound spirally, forming a chamber in which the parasite lives, which is closely similar to that produced by *Pemphigus bursarius* upon the stems of poplar leaves.

Myzostoma deformator bores its way into the interior of the pinnule, which becomes swollen and pear-shaped (Pl. XII.). Another kind of malformation is produced by the two species *Myzostoma pentacrini* and *Myzostoma tenuispinum*. The former causes insignificant thickenings of the arm-joints (Pl. XI. fig. 9) and fissures between them. Much more

remarkable are the cysts of *Myzostoma tenuispinum* (Pl. XIII. figs. 6 and 11–16), which consist of small fusiform oval chambers, arranged longitudinally or transversely, and formed by the enlargement of some of the brachialia or basalia; these are extremely conspicuous, since they do not become gradually flattened. A third group of malformations consist in independently formed cysts, *i.e.*, cysts that are not produced by the transformation of a pinnule or an arm-joint. These cysts appear upon the ambulacral surface, and are either sessile and of various forms (*Myzostoma cysticolum*, Pl. XIII. figs. 1–3), or pedunculate and club-shaped (*Myzostoma murrayi*, Pl. XV. figs. 5–9). *Myzostoma inflator* (Pl. XV. figs. 1, 2) produces both sessile and stalked cysts.

Finally, there are compound cysts (Pl. XIV. fig. 8), due to the approximation and fusion of the two different cysts formed by *Myzostoma willemoesii* and *Myzostoma tenuispinum*, the latter on the arm-joint and the former on its pinnule.

In the following Tables are given complete lists of the known species of *Myzostoma* and their hosts:—

TABLE I.

List of species of Myzostomida.

Species of *Myzostoma*.	Host.	Received from.
M. horologium, n. sp.	*Actinometra jukesi*, P. H. C.	Challenger Expedition.
	„ *strata*, P. H. C.	Do. do.
M. longipes, n. sp.	Uncertain.	"Blake."
M. chinesicum, n. sp.	Uncertain.	Dr. J. W. Spengel.
M. labiatum, n. sp.	*Antedon inæqualis*, P. H. C.?	Challenger Expedition.
M. echinus, n. sp.	*Antedon incisa*, P. H. C.?	Do. do.
	„ *inæqualis*, P. H. C.?	Do. do.
	Actinometra mutabilis, Lütken, MS.	Copenhagen Museum.
M. alatum, Graff.	*Antedon phalangium*, Müll., sp.	"Porcupine."
M. costatum, F. S. L.	*Antedon savignyi*, Müll., sp., or „ *palmata*, Müll., sp.?	Prof. v. Siebold.
	„ *triquetra*, Semp., MS.	Prof. C. Semper.
	Actinometra parvicirra, Müll., sp.	Do.
M. plicatum, n. sp.	*Antedon tenax*, Lütken, MS.	Copenhagen Museum.

Species of *Myzostoma*.	Host.	Received from.
M. rubrofasciatum, n. sp.	Uncertain.	Prof E. Hæckel.
M. glabrum, F. S. L.	*Antedon rosacea.*	Many European Localities.
M. gigas, Lütken, MS.	*Antedon eschrichti*, Müll., sp.	Copenhagen Museum.
		Bergen Museum.
		"Porcupine."
	„ *eschrichti* or *quadrata*, P. H. C.	"Willem Barents."
		Challenger Expedition.
	„ *carinata*, Leach, sp.	Do. do.
M. testudo, n. sp.	*Actinometra lineata*, P. H. C.	"Blake."
M. lütkeni, n. sp.	*Actinometra intricata*, Lütken, sp.	Copenhagen Museum.
M. pallidum, Graff.	*Actinometra solaris*, Lam., sp.	Prof. C. Semper.
	„ *parvicirra*, Müll., sp.	Do.
M. marginatum, n. sp.	*Actinometra discoidea*, P. H. C.	"Blake."
M. brevipes, n. sp.	*Antedon pourtalesii*, P. H. C.	Do.
M. carpenteri, Graff.	*Antedon dentata*, Say.	"Triton."
M. areolatum, n. sp.	*Actinometra blakei*, P. H. C.	"Blake."
	„ *meridionalis*, var. *quadrata*, P. H. C.	Do.
M. triste, Graff.	*Actinometra parvicirra*, Müll., sp.	Prof. C. Semper.
	Uncertain.	British Museum.
		Copenhagen Museum.
M. coriaceum, n. sp.	*Antedon insignis*, Bell, MS.	British Museum ("Alert.")
M. radiatum, n. sp.	*Actinometra meridionalis*, A. Ag.?	Kiel Museum.
M. pulvinar, Graff.	*Antedon phalangium*, Müll., sp.	"Porcupine."
M. calycotyle, n. sp.	*Pentacrinus alternicirrus*, P. H. C.	Challenger Expedition.
M. compressum, n. sp.	*Bathycrinus aldrichianus*, Wyv. Th.	Do. do.
M. brevicirrum, n. sp.	*Actinometra mutabilis*, Lütken, MS.	Copenhagen Museum.
M. pictum, n. sp.	*Antedon spinifera*, P. H. C.?	"Blake."
M. nigrescens, n. sp.	*Actinometra morsei*, P. H. C.	Mus. Comp. Zool., Cambridge.

Species of *Myzostoma*.	Host.	Received from.
M. cirriferum, F. S. L.	*Antedon rosacea.*	Many European Localities.
	„ *petasus*, P. H. C.	P. H. Carpenter.
		Kiel Museum.
		"Triton."
	„ *hystrix*, P. H. C.	"Porcupine."
M. crenatum, n. sp.	*Actinometra meridionalis*, A. Ag. ?	"Blake."
		Mus. Comp. Zool. ("Investigator").
M. wyville-thomsoni, n. sp.	*Metacrinus costatus*, P. H. C.	Challenger Expedition.
	„ *angulatus*, P. H. C.	Do. do.
M. vastum, n. sp.	*Actinometra japonica*, Müll., sp.	Leydèn Museum.
	„ *blakei*, P. H. C.	"Blake."
M. agassizii, n. sp.	*Antedon hageni*, Pourt.	"Bibb."
	„ *spinifera*, P. H. C. ?	"Blake."
M. dubium, Graff.	*Antedon triquetra*, Semp., MS.	Prof. C. Semper.
	„ *dubia*, Semp., MS.	Do.
M. mœbianum, n. sp.	*Comatula*, sp. ?	Prof. K. Möbius.
M. elongatum, Graff.	*Antedon triquetra*, Semp., MS.	Prof. C. Semper.
M. verrucosum, Graff.		
M. dentatum, n. sp.	*Antedon bidentata*, P. H. C.	Challenger Expedition.
M. fimbriatum, n. sp.	*Antedon eschrichti*, Müll., sp., or „ *quadrata*, P. H. C.	Challenger Expedition.
M. excisum, n. sp.	*Antedon hageni*, Pourt.	"Bibb."
	„ *impinnata*, P. H. C.	Kiel Museum.
M. irregulare, n. sp.	*Actinometra meridionalis*, A. Ag.	"Bibb" and "Blake."
		Copenhagen Musuem.
	„ *meridionalis*, var. *carinata*, P. H. C.	"Blake."
M. caribbeanum, n. sp.	Uncertain.	Do

Species of *Myzostoma*.	Host.	Received from.
M. rotundum, n. sp. *M. oblongum*, n. sp.	*Actinometra meridionalis*, var. *carinata*, P. H. C.?	"Blake."
M. abundans, n. sp.	*Actinometra pulchella*, Pourt., sp.	Do.
M. elegans, Graff.	*Antedon triquetra*, Semp., MS.	Prof. C. Semper.
	Actinometra parvicirra, Müll., sp.	Do.
	,, *meridionalis*, A. Ag., sp.	"Bibb."
M. antennatum, n. sp.	Uncertain.	Kiel Museum.
M. cornutum, Graff.	*Antedon triquetra*, Semp., MS.	Prof. C. Semper.
M. brachiatum, Graff.	*Actinometra nigra*, Semp., MS.	Do.
M. fissum, n. sp.	*Antedon inæqualis*, P. H. C.?	Challenger Expedition.
M. intermedium, n. sp.	*Antedon multiradiata*, P. H. C.	Do. do.
M. quadrifilum, n. sp.	*Antedon bidentata*, P. H. C.	Do. do.
M. quadricaudatum, n. sp.	*Antedon fluctuans*, P. H. C.	Do. do.
M. lobatum, Graff.	*Actinometra fimbriata*, Müll.	Prof. C. Semper.
M. bicaudatum, n. sp.	*Actinometra meridionalis*, A. Ag., sp.	"Bibb."
M. filicauda, n. sp.	*Antedon hageni*, Pourt.	"Corvin."
M. filiferum, n. sp.	*Antedon bidentata*, P. H. C.	Challenger Expedition.
M. carinatum, n. sp.	*Antedon impinnata*, P. H. C.	Kiel Museum.
	Actinometra pulchella, Pourt., sp.	"Blake."
M. coronatum, n. sp.	*Bathycrinus aldrichianus*, Wyv. Th.	Challenger Expedition.
M. folium, n. sp.	*Antedon manca*, P. H. C.	Do. do.
M. asymmetricum, n. sp.	*Pentacrinus alternicirrus*, P. H. C.	Do. do.
M. pentacrini, n. sp.		Do. do.
M. deformator, n. sp.		Do. do.
M. cysticolum, n. sp.	*Actinometra meridionalis*, var. *carinata*, P. H. C.	"Hassler." "Blake."

Species of *Myzostoma*.	Host.	Received from.
M. tenuispinum, n. sp.	*Antedon inæqualis*, P. H. C.	Challenger Expedition.
	„ *incisa*, P. H. C.	Do. do.
	„ *angusticalyx*, P. H. C.	Do. do.
	„ *basicurva*, P. H. C.	Do. do.
M. willemoesii, n. sp.	*Antedon basicurva*, P. H. C.	Do. do.
	„ *inæqualis*, P. H. C.	Do. do.
M. inflator, n. sp.	*Antedon angustiradia*, P. H. C.	Do. do.
	Actinometra pulchella, Pourt., sp.	"Blake."
M. murrayi, n. sp.	*Antedon angustiradia*, P. H. C.	Challenger Expedition.
	„ *radiospina*, P. H. C.	Do. do.
	„ *duplex*, P. H. C.	"Blake."
Stelechopus hyocrini, n. g., n. sp.	*Hyocrinus*, sp. ?	Challenger Expedition.

Table II.

List of Crinoids on which Myzostomida *have been hitherto found.*

Host.	Species of *Myzostoma*.	Living.
Antedon angusticalyx, P. H. C.	*M. tenuispinum*, n. sp.	In roundish arm cysts.
„ *angustiradia*, P. H. C.	*M. inflator*, n. sp.	In independent sessile cysts.
	M. murrayi, n. sp.	In independent stalked cysts.
„ *basicurva*, P. H. C.	*M. willemoesii*, n. sp.	In spiral malformations of the pinnules.
	M. tenuispinum, n. sp.	In roundish arm cysts.
„ *bidentata*, P. H. C.	*M. dentatum*, n. sp.	Free.
	M. quadrifilum, n. sp.	Do.
	M. filiferum, n. sp.	Do.
„ *carinata*, Leach, sp.	*M. gigas*, Lütken.	Do.

Host.	Species of *Myzostoma*.	Living.
Antedon dentata, Say.	*M. carpenteri*, Graff.	Free.
,, *dubia*, Semp., MS.	*M. dubium*, Graff.	Do.
,, *duplex*, P. H. C.	*M. murrayi*, n. sp.	In independent stalked cysts.
,, *eschrichti*, Müll., sp.	*M. gigas*, Lütken.	Free.
	M. fimbriatum, n. sp. ?	Do.
,, *fluctuans*, P. H. C.	*M. quadricaudatum*, n. sp.	Do.
,, *hageni*, Pourt.	*M. agassizii*, n. sp.	Do.
	M. excisum, n. sp.	Do.
	M. filicauda, n. sp.	Do.
,, *hystrix*, P. H. C.	*M. cirriferum*, F. S. L.	Do.
,, *impinnata*, P. H. C.	*M. excisum*, n. sp.	Do.
	M. carinatum, n. sp.	Do.
,, *inæqualis*, P. H. C.	*M. labiatum*, n. sp. ?	Do.
	M. echinus, n. sp. ?	Do.
	M. fissum, n. sp. ?	Do.
	M. tenuispinum, n. sp.	In roundish arm cysts.
	M. willemoesii, n. sp.	In spiral malformations of the pinnules.
,, *incisa*, P. H. C.	*M. echinus*, n. sp. ?	Free.
	M. tenuispinum, n. sp. ?	In roundish arm cysts.
,, *insignis*, Bell, MS.	*M. coriaceum*, n. sp.	Free.
,, *manca*, P. H. C.	*M. folium*, n. sp.	Do.
,, *multiradiata*, P. H. C.	*M. intermedium*, n. sp.	Do.
,, *palmata*, Müll., sp.	*M. costatum*, F. S. L. ?	Do.
,, *petasus*, P. H. C.	*M. cirriferum*, F. S. L.	Do.
,, *phalangium*, Müll., sp.	*M. alatum*, Graff.	Do.
	M. pulvinar, Graff.	Do.
,, *pourtalesii*, P. H. C.	*M. brevipes*, n. sp.	Do.
,, *quadrata*, P. H. C.	*M. gigas*, Lütken ?	Do.
	M. fimbriatum, n. sp. ?	Do.

Host.	Species of *Myzostoma*.	Living.
Antedon radiospina, P. H. C.	*M. murrayi*, n. sp.	In independent stalked cysts.
,, *rosacea.*	*M. glabrum*, F. S. L.	Free.
	M. cirriferum, F. S. L.	Do.
,, *savignyi*, Müll., sp.	*M. costatum*, F. S. L. ?	Do.
,, *spinifera*, P. H. C.	*M. pictum*, n. sp. ?	Do.
	M. agassizii, n. sp. ?	Do.
,, *tenax*, Lütken, MS.	*M. plicatum*, n. sp.	Do.
,, *triquetra*, Semp., MS.	*M. dubium*, Graff.	Do.
	M. costatum, F. S. L.	Do.
	M. elongatum, Graff.	Do.
	M. verrucosum, Graff.	Do.
	M. elegans, Graff.	Do.
	M. cornutum, Graff.	Do.
Actinometra blakei, P. H. C.	*M. areolatum*, n. sp.	Do.
	M. vastum, n. sp.	Do.
,, *discoidea*, P. H. C.	*M. marginatum*, n. sp.	Do.
,, *fimbriata*, Müll.	*M. lobatum*, Graff.	Do.
,, *japonica*, Müll., sp.	*M. vastum*, n. sp.	Do.
,, *intricata*, Lütken, MS.	*M. lütkeni*, n. sp.	Do.
,, *jukesi*, P. H. C.	*M. horologium*, n. sp.	Do.
,, *lineata*, P. H. C.	*M. testudo*, n. sp.	Do.
,, *meridionalis*, A. Ag., sp.	*M. radiatum*, n. sp. ?	Do.
	M. crenatum, n. sp. ?	Do.
	M. irregulare, n. sp.	Do.
	M. elegans, Graff.	Do.
	M. bicaudatum, n. sp.	Do.
,, *meridionalis*, var. *carinata*, P. H. C.	*M. irregulare*, n. sp.	Do.
	M. rotundum, n. sp. ?	Do.
	M. oblongum n. sp. ?	Do.
	M. cysticolum, n. sp.	In independent sessile cysts on the pinnules and on the ambulacral side of the arms.

Host.	Species of *Myzostoma*.	Living.
Actinometra meridionalis, var. *quadrata*, P. H. C.	*M. areolatum*, n. sp.	Free.
,, *morsei*, P. H. C.	*M. nigrescens*, n. sp.	Do.
,, *mutabilis*, Lütken, MS.	*M. echinus*, n. sp.	Do.
	M. brevicirrum, n. sp.	Do.
,, *nigra*, Semp., MS.	*M. brachiatum*, Graff.	Do.
,, *parvicirra*, Müll., sp.	*M. costatum*, F. S. L.	Do.
	M. pallidum, Graff.	Do.
	M. triste, Graff.	Do.
	M. elegans, Graff.	Do.
,, *pulchella*, Pourt., sp.	*M. abundans*, n. sp.	Do.
	M. carinatum, n. sp.	Do.
	M. inflator, n. sp.	In independent sessile cysts.
,, *solaris*, Lam., sp.	*M. pallidum*, Graff.	Free.
,, *strata*, P. H. C.	*M. horologium*, n. sp.	Do.
Comatula, sp.?	*M. mœbianum*, n. sp.	Do.
Pentacrinus alternicirrus, P. H. C.	*M. calycotyle*, n. sp.	Do.
	M. asymmetricum, n. sp.	Sticking fast to and enlarging the pinnules.
	M. pentacrini, n. sp.	In swellings on the arms.
	M. deformator, n. sp.	Inside the pinnules, which become swollen and ovoid.
Bathycrinus aldrichianus, Wyv. Th.	*M. compressum*, n. sp.	Free.
	M. coronatum, n. sp.	Do.
Metacrinus costatus, P. H. C.	*M. wyville-thomsoni*, n. sp.	Do.
,, *angulatus*, P. H. C.	*M. wyville-thomsoni*, n. sp.	Do.
Hyocrinus, sp.?	*Stelechopus hyocrini*, n. g., n. sp.	Do.

It appears from the two foregoing lists that the sixty-eight species of Myzostomida are distributed upon fifty-two hosts in the following manner :—

48	species	have	each	1 host.
13	„	„	„	2 hosts.
6	„	„	„	3 hosts.
1	„	„	„	4 hosts.

In those cases, however, where one species infests more than one host, the latter are always closely allied, and in no case is there an instance of a single species of this parasite being found both upon a stalked Crinoid and one that has no stalk.

With regard to the number of different species of Myzostomida that are found upon a single host it appears that

31	species of	Crinoidea	are infested by	1	species of	*Myzostoma.*
12	„	„	„	2	„	„
3	„	„	„	3	„	„
3	„	„	„	4	„	„
2	„	„	„	5	„	„
1	„	„	„	6	„	„

Systematic Remarks.

The definition of the group Myzostomida, which I place as an Order in the Class Stelechopoda (Genus Myzostoma, p. 71), must be altered to admit the new form *Stelechopus hyocrini* (see special description); this species has a straight alimentary canal and no suckers nor male genital apertures. There are also other forms that are more certainly dicœcious.

Order Myzostomida.—Symmetrical non-segmented animals, provided with an external chitinous cuticle, five pairs of movable parapodia, each with a hook and supporting rod, an alimentary canal with oral and anal apertures; through which latter the eggs are extruded. Dicœcious or hermaphrodite; central nervous system consisting of an oblong mass situated beneath the intestine, and giving off two branches in front which encircle the pharynx, but bear no ganglia, and several other pairs of lateral nerves. No circulatory, respiratory, nor excretory organs. Parasitic on and in Crinoids.

Family I. *Stelechopidæ.*—Myzostomida with straight alimentary canal; parapodia independent of each other; no internal muscular septa. Suckers absent. Probably hermaphrodite, sexual products reaching the exterior through a cloaca.

Family II. *Myzostomidæ.*—Myzostomida with ramified alimentary canal, parapodia connected by muscles which converge to a central muscular mass. Body

cavity divided into paired chambers by incomplete septa. Usually four pairs of suckers. Hermaphrodite or dicœcious. Ova evacuated through a cloaca, male generative apertures situated laterally.

Of the first Family we have at present but one representative; the second Family contains sixty-seven species. I have, however, been unable to classify them in a satisfactory manner, chiefly because, as has been already mentioned, the state of preservation of many of the individuals rendered it impossible to make out with any certainty the structure of various organs important for systematic purposes. I could not, for example, ascertain whether all the free-living species were really hermaphrodite, as I should have been obliged to destroy several unique specimens in order to determine whether the testes were present or not. If this point had been placed beyond a doubt, I should have divided the second Family into two groups—(*a*) hermaphrodite forms; (*b*) dicœcious forms. In the same way with many other secondary characters,—such as the presence or absence of suckers, the muscular septa, &c.,—it was impossible to make a thorough investigation.

The following Table of Species, therefore, is given only for use in the determination of species. No doubt when more abundant material has been examined it will be possible to give a generic sub-classification of the Family Myzostomidæ.

Table of Species.

I. With ramified intestinal canal. Family Myzostomidæ, genus *Myzostoma*.
* Free-living, not forming cysts (mostly with suckers).
* * Mouth terminal or ventral.
* * * Without caudal appendages.
* * * * With distinct suckers.
* * * * * Border of the disk quite smooth.
Border of the mouth covered with papillæ, . . . *M. labiatum.*
Border of the mouth without papillæ.
Back with radial series of hard tubercles, . . . *M. echinus.*
Back without tubercles.
Parapodia long, placed near the border.
Back two-coloured, ... *M. horologium.*
Back one-coloured.
Skin of the back light yellow, with tubercles, . . *M. longipes.*
Skin of the back grey-brown, areolated, . . *M. chinesicum.*
Parapodia short, nearer to the centre, . . . *M. alatum.*
* * * * * Border of the disk irregularly toothed.
Body oblong, extended, with few obtuse ribs, . . . *M. rubrofasciatum.*
Body circular.
With numerous sharp-edged ribs, ... *M. plicatum.*
With numerous obtuse ribs, ... *M. costatum.*

* * * * * Border of the disk with cirri.
* * * * * * Ten cirri on each side.
* * * * * * * Cirri very short, body stout and opaque; mostly very big, with a vaulted back.
Body oblong, extended, with a keel-like back, laterally compressed, ... *M. compressum.*
Body disk-like.
Body much longer than broad, flat above and below, . *M. areolatum.*
Body circular, length and breadth equal, or nearly equal.
Central muscle-mass striking:
Occupying the whole border of the belly; back flat, . *M. radiatum.*
A marginal zone free; back vaulted.
Back covered with warts, ... *M. marginatum.*
Back irregularly areolated, without warts, . . *M. lütkeni.*
Central muscle-mass not striking.
With a distinct hyaline marginal border.
Parapodia small, lying in small cavities, . . *M. brevipes.*
Parapodia well-developed, freely projecting, . . *M. pallidum.*
A hyaline marginal border not existing.
With five pairs of dorsal elevations, . . . *M. testudo.*
Back without elevations.
Parapodia very feeble, quite close to the border, . *M. carpenteri.*
Parapodia well-developed, removed from the border.
Cirri distinct, many times longer than broad.
Body very big and massive, back with scattered tubercles, ... *M. gigas.*
Body of insignificant size, without warts.
Diameter of more than 9 mm.; parapodia in the first third of the radius, . . *M. coriaceum.*
Scarcely half as big; parapodia in the middle between centre and border, . . *M. triste.*
Cirri reduced to insignificant warts, . . *M. glabrum.*
* * * * * * * Cirri (mostly) long; body generally a thin, transparent, delicate plate.
Middle part of the body two-coloured, ... *M. pictum.*
Middle part of the body one-coloured.
The whole body opaque, stout, black-brown, . . . *M. nigrescens.*
The whole body, or at least the border, pellucid, delicate.
With marginal fringes besides the cirri, . . . *M. fimbriatum.*
Without marginal fringes.
Hind end deeply intersected, ... *M. excisum.*
Hind end bordered, rounded.
Cirri reduced to warts, ... *M. brevicirrum.*
Cirri well-developed, long.
Cirri much different in length (the first and tenth pairs often longer than the others), . . *M. antennatum.*
Cirri not much different.
Border notched, ... *M. crenatum.*
Border not notched.
Cirri ending in fine points, . . . *M. agassizii.*

Cirri with obtuse points.
Parapodia slit, ... *M. wyville-thomsoni.*
Parapodia not slit.
Body rounded, length of the cirri often greater than the breadth of the border, *M. vastum.*
Body oval; cirri somewhat greater than the breadth of the marginal border, . *M. cirriferum.*

* * * * * More than ten cirri on each side.
Cirri as large obtuse flaps, nearly as broad as long.
Central disk prominent on the ventral side, . . . *M. verrucosum.*
Central disk not prominent, ... *M. dentatum.*
Cirri normal, lessened at the point.
Body much longer than broad.
Cirri sharply separated from the border.
Some pairs of the cirri extraordinarily elongated.
The first pair alone elongated, ... *M. cornutum.*
More (five to six) pairs elongated, . . . *M. brachiatum.*
No cirri of an extraordinary length.
Suckers quite near the border, . . . *M. oblongum.*
Suckers moved from the border, more than the breadth of the suckers, ... *M. caribbeanum.*
Cirri with a large base rising gradually out of the border.
Intestine much ramified, ... *M. elongatum.*
Intestinal branches not very numerous, ... *M. mœbianum.*
Body circular, not, or not much, different in length and breadth.
On each side not more than twenty cirri.
Cirri sharply separated from the border, . . . *M. irregulare.*
Cirri with a large base, rising gradually out of the border, *M. dubium.*
More than twenty cirri on each side.
Cirri ending in very fine points, ... *M. elegans.*
Cirri ending obtusely.
Suckers round, parapodia feeble and small, . . *M. rotundum.*
Suckers oblong, parapodia vigorous and big, . . *M. abundans.*

* * * * Suckers are wanting.
Border irregularly notched; back smooth, ... *M. folium.*
Border with ten pairs of cirri, back areolated, . . . *M. coronatum.*
Border with more than twenty cirri, back ribbed, . . . *M. carinatum.*

* * * With caudal appendages.
Two caudal appendages existing.
Caudal appendages without terminal threads, . . . *M. bicaudatum.*
Caudal appendages with terminal threads.
Terminal thread shorter than the base of the caudal appendages, . *M. filicauda.*
Terminal thread longer than the base of the caudal appendages, . *M. filiferum.*
Four caudal appendages existing.
Caudal appendages large and flat, with a notched lateral border, . *M. lobatum.*
Caudal appendages round.
Caudal appendages without terminal threads, . . . *M. quadricaudatum.*
Caudal appendages with terminal threads, ... *M. quadrifilum.*
Six caudal appendages existing.
Caudal appendages large and flat, without terminal threads, . . . *M. fissum.*

Caudal appendages round, with terminal threads, . . . *M. intermedium.*

* * Mouth (and cloaca) dorsal.

With large, prominent, ventral elevation, without suckers, . . *M. pulvinar.*

Body thin, without central elevation, with stalked suckers, . . *M. calycotyle.*

* Living in cysts or forming malformations of the pinnules, without suckers.

Living on the pinnule which becomes enlarged on the ventral side, . . *M. asymmetricum.*

Living in the interior of cysts.

Androgynous, all individuals equally formed.

Border with cirri, cysts as thickenings of the arms, . . . *M. pentacrini.*

Border without cirri, cysts as swollen pinnules, . . . *M. deformator.*

Sexes separated, large female and dwarf male individuals.

Cysts as intumescences of the arm-joints (border of the body with cirri), ... *M. tenuispinum.*

Cysts as spirally rolled-up pinnules (border of the body with cirri), . *M. willemoesii.*

Cysts as independent new formations of the skin of the host (border of the body without cirri).

Female often thicker in the middle than in the lateral parts, cysts not stalked, ... *M. cysticolum.*

Female of uniform thickness, cysts mostly stalked.

Male with ramified testis, ... *M. inflator.*

Male with compact testis, ... *M. murrayi.*

II. Intestine straight, not ramified (without suckers). Family and genus *Stelechopus*, only one species, ... *St. hyocrini.*

To this table I may be permitted to add some remarks about the natural affinities of the different species. The starting-point of the whole group is doubtless the Tardigrade-like form *Stelechopus hyocrini.* From some form like this *Myzostoma folium* has been developed; it is characterised by an extended worm-like body, the absence of suckers, and by an arrangement of the parapodia, similar to that of *Stelechopus.* The ancestral form, however, had in all probability muscular septa placed at right angles to the long axis of the body and not radially. Out of these other elongated forms with suckers were developed, which in their turn gave rise to the more discoid species.

A greater or less degree of mobile power may have produced the two different groups already alluded to, one of which is distinguished by its thin body and hyaline marginal portion, by the feeble development of the parapodia and their enclosed structures, and by the length of the cirri; the other by the massive form of its body, and by the great development of parapodia and muscles, and the short cirri, which are sometimes altogether absent.

In some species of the second group the change in position of the cloaca (*Myzostoma alatum* and *Myzostoma glabrum*), or of mouth and cloaca (*Myzostoma pulvinar* and *Myzostoma calycotyle*) to the dorsal surface, is to be looked upon as having been produced by the firm attachment of the parasite to the skin of its host by the great development of parapodia and suckers.

In the first group we find differences in the number of the cirri, some having twenty,

and some an unlimited number; the former appear to me to be the most specialised forms. The Myzostomida Caudata with the caudal appendages have originated from discoid forms (see p. 8), in which some of the cirri have taken on a special development, whereas the Myzostomida Cysticola would seem to be retrograde forms, from the absence of suckers and the rudimentary radially arranged parapodia, as well as from the presence of muscular septa and the central convergence of the parapodial muscles. They have probably originated partly from the stout sessile species and partly from the more delicate free living species, as shown by the fact that the cirri are sometimes entirely absent (*Myzostoma cysticolum*), and sometimes, on the other hand, highly developed (*Myzostoma willemoesii*) in both sexes. The last-mentioned species is also remarkable from the fact that both sexes possess well-developed suckers, and shows therefore a less degree of degeneration than the other cysticolous forms; also the male has the typical ramified form of the testis found in the free living species, and not the compact rounded organ of the other Myzostomida Cysticola.

DESCRIPTION OF SPECIES.

Myzostoma, F. S. Leuckart.

1. *Myzostoma horologium*, n. sp. (Pl. I. figs. 1–17).

This form, of which I was able to investigate a great number of examples, closely resembles our European form, *Myzostoma glabrum*, but has not the central muscular mass so highly developed. The dorsal surface is generally flat or somewhat vaulted and bent upwards at the margins. The diameter of the body in the largest specimen was 6 mm. The skin of the back has no conical papillæ like those of *Myzostoma glabrum*, but merely some irregular wrinkles, and these only in large specimens. Cirri are entirely wanting. The pigment is arranged in much the same fashion as in *Myzostoma glabrum* (*cf.*, Genus Myzostoma, pl. i. figs. 2–10), but there is only a single median longitudinal line instead of two, which, however, differs considerably in different individuals. The typical coloration is shown in fig. 4; it resembles very much the dial of a watch divided into ten parts with two large hands. The central point of the dorsal surface is generally a little depressed and devoid of pigment, and is but rarely extended lengthways or provided with a central pigment spot. There are also four pairs of pigment spots on the margin corresponding to the suckers. The most frequent modification of this is shown in fig. 5, where it will be seen that there is an additional mass of pigment at each end of the median line, and that each of the marginal lines of pigment is divided into two parts. In the specimen displayed in fig. 9 the pigment is removed from the border of the body. On account of the lateral continuations of the marginal lines, this individual forms a transition to the varieties represented in figs. 6–11, which are characterised by the great quantity of pigment present, as well as by the unilateral or symmetrical anastomosis of the marginal lines with each other and with the median line. Figs. 7, 8 are the extremes of these dark coloured forms; fig. 8 shows a number of supernumerary spots, and a black border round the whole dorsal surface. There are also other varieties but slightly pigmented (figs. 12–14), with an incomplete median line and without some of the marginal lines. One of the most aberrant modifications is shown in fig. 13; the light central point is wanting in this form, and the coloration is asymmetrical.

The spirit specimens of *Myzostoma horologium* that I have in my possession vary in their ground-colour from white or sulphur-yellow to a dark brownish-yellow. Von

Willemoes Suhm has described the colour of this species in the living state[1] as being white with black spots. The black pigment I discovered by transverse sections to be placed in a layer beneath the epidermis, intersected by fibrils which are especially developed on the dorsal side, and indeed disappear entirely on the ventral side (fig. 3, *cu.*). The ventral side (figs. 1, 2) is of an even brownish tint, and shows a central elevation corresponding to the ventral ganglion and central muscular mass, with its continuations towards the mouth (*m.*) and cloaca (*cl.*), and radial elevations corresponding to the muscle bundles which run from the central muscle mass to the parapodia (*p.*) and suckers (*s.*).

The parapodia (*p.*) are highly developed, and placed close to the external margin, in consequence of which their extremities are to be seen from above. The hooks (fig. 15) are very strong, measuring ·17–·22 mm. in length, and up to ·03 mm. in thickness; the tip is bent at a right angle. The column of the manubrium is very short (fig. 16), not much more than half as long as the hook. The manubrium (*ma.*) is highly developed, and made up of three shovel-shaped prongs.

The suckers (*s.*) are placed between the bases of the parapodia and the margin of the body; sometimes they project considerably, but are usually depressed as shown in fig. 3, where the sucker occupies half the thickness of the body, and is entirely retracted into its sheath (*s.*). The epithelium covering the sucker (*se.*) is markedly thicker than that over the rest of the body (*e.*). The free margin of the sucker has in some individuals a crown of brownish papillæ, which are also occasionally found upon the parapodia. Viewed with a lens they look like chitinous spicules, but are really only elevations of the integument coloured brown by the enclosed pigment. In some individuals these structures can be seen with the naked eye, in others the papillæ appear to be absent or present, but without any pigment. The pharynx is relatively small, and the mouth (*m.*), also small, is some way removed from the margin of the body. The obtusely-conical cloacal papilla (*cl.*) is placed immediately beneath the hinder end of the body. This ventral situation of the cloaca is the most remarkable difference between this species and *Myzostoma glabrum.*

The sexual organs resemble those of the last-mentioned species, and the young are attached to the body of the adult in the same way (see Genus Myzostoma, p. 63).

The diffuse brown coloration of the young specimens is remarkable, resembling that of some adult specimens of *Myzostoma glabrum* (*loc. cit.*, pl. i. figs. 3, 4).

Host.—Uncertain. Dredged by Challenger Expedition at Stations 186, 187 (Cape York). The specimens, according to the notes of P. H. Carpenter, most probably come

[1] "In der Arafura-See habe ich im vorigen Jahre einmal 80 Exemplare einer grossen Comatula untersucht und fand circa auf jeder zehnten unsere Schmarotzer. Es ist das das grösste Myzostomum, das ich je gesehen habe. Sie sassen oder krochen schlängelnd auf den Kelchen, selten in der Rinne der Arme. Meist fanden sich 2–3 grosse Thiere und mit ihnen ein kleineres. Alle diese Myzostomen waren, wie die Comatula, weiss und schwarz gefleckt, und die übrigen zahlreichen Schmarotzer des Thieres zeigten dieselbe Färbung."—Von der Challenger-Expedition, Brief VI. *Zeitschr. f. wiss. Zool.* Bd. xxvi. p. lxxix.

from *Actinometra jukesi*, P. H. C., and *Actinometra strata*, P. H. C., the first of which was found exclusively at Station 187, the latter at both Stations. Some specimens sent to me by Sir Wyville Thomson were labelled "Myzostomum from disk of *Phanogenia*" (probably = *Actinometra jukesi*, P. H. C.).

2. *Myzostoma longipes*, n. sp. (Pl. II. figs. 24–28).

The single specimen that I had measures nearly 2 mm. in diameter. It is ochre-coloured, and the flat margin is without cirri and bent upwards so that the animal is quite plate-shaped (see ideal section, fig. 27). The dorsal surface is covered with minute warts especially developed in the centre, where they are separated from each other by deep furrows; on the lateral parts of the dorsal surface they are smaller and closely adpressed. Towards the margin, which is hardly at all transparent, they disappear. The thickness of the body is in relation to the great development of the muscles; there is the large central elevation with the radial ridges on the ventral side (fig. 25). The fibrils of the parapodial muscles may be distinctly seen with a lens through the wall of the body. The basal portions of the parapodia occupy about the middle third of the radius from the central muscular mass to the margin of the body. The free ends of the parapodia extend beyond the margin of the body, and may be seen from the dorsal surface (fig. 24). The parts of the hook-apparatus (fig. 28) are extremely short, but very thick and stout. The tip of the hook is slightly bent, and is ·09 mm. long; the greatest thickness at the base is ·02 mm. The manubrium (*ma.*) is ·05 mm. long, and increases in size at the free end into an obtuse shovel-like manubrial plate, which occupies more than one-third of its whole length.

The muscles of the suckers, like those of the parapodia, are well developed, and the suckers themselves are large and distinct.

The mouth is sub-terminal; the pharynx is provided with finely serrated walls (*ph.*). The cloacal papilla is on the hind margin of the ventral side.

Host.—Uncertain. Dredged by the "Blake" Expedition at Station 269 (St. Vincent).

3. *Myzostoma chinesicum*, n. sp. (Pl. II. fig. 31).

This species belongs to the Godeffroy Museum at Hamburgh, and I obtained it through the kindness of Dr. J. W. Spengel. It resembles closely *Myzostoma horologium* in size and thickness of body, and like the latter has the dorsal surface flattened and its margins turned up; the majority of specimens—unlike that shown in fig. 31—display a circular contour. The diameter of the disk is 2·4 mm.; there are no cirri, and the parapodia and suckers are without the tubercles seen in *Myzostoma horologium*. The parapodia have a number of circular wrinkles, and the suckers show a beautiful radial folding; the male genital papillæ of some individuals are nearly as prominent as in *Myzostoma gigas*. The main feature of this species consists in the uniform brownish-grey colour of the back

and ventral surface, which sometimes inclines to green. The back is divided by a series of furrows into polygonal areas, which are continued for a short way on to the ventral surface.

Host.—Uncertain. Dredged in the Chinese Sea.

4. *Myzostoma labiatum*, n. sp. (Pl. II. fig. 23).

This species is not unlike *Myzostoma lütkeni*, but differs from it in that the ventral elevation does not differ in colour and consistency from the rest of the ventral surface, and that the parapodia (*p.*) and suckers (*s.*) are further out.

The suckers also are smaller than in *Myzostoma lütkeni*, and have a finely papillose margin.

The uniformly greyish-brown body is somewhat more than 4 mm. in diameter; it is circular and unprovided with cirri. On the dorsal surface is a median elevation, and on each side five elevations corresponding to the parapodia. On the ridges formed by these latter the folds, which are developed over the whole body both above and below, take the shape of small wart-like processes. The pharynx (*ph.*) is distinctly visible, with the crown of papillæ, and makes the resemblance to *Myzostoma lütkeni* still more obvious. A closer examination shows that these papillæ (fifteen to be seen from the ventral side, the longest measuring ·3 mm.) belong really not to the pharynx but to the margin of the mouth, and therefore at once serve to distinguish this species. The conical cloacal papilla is very prominent, and lies at the same distance from the margin as the suckers.

Host.—Probably *Antedon inæqualis*, P. H. C. Dredged by the Challenger Expedition at Station 174, south-west of the Fiji Islands.

5. *Myzostoma echinus*, n. sp. (Pl. II. figs. 29–30).

This is one of the most remarkable species, owing to its size and the sculpturing of the back. The body is nearly hemispherical, with a flat ventral side of 5 mm. diameter. The back is grey inclining to brown, and very finely folded to form irregular lines, which are conspicuous and visible even with a simple lens. The dorsal surface is also ornamented by high cylindrical tubercles of a brown colour and considerable hardness. These tubercles bear smaller tubercles upon them, which are sometimes ramified. The arrangement of these tubercles corresponds to the structural arrangement of the body. First there is a median rank, running from the anterior to the posterior end of the body; on either side of this are five longer rows, each containing seven to ten tubercles and corresponding to the parapodia; between them are shorter lines containing three to five smaller tubercles, which correspond to the suckers. Occasionally several tubercles of one row are joined by continuous ridges of the colour and consistence of the tubercles themselves. The flat ventral surface is folded (fig. 30) like the back, but the smaller folds are not so distinctly

visible. The parapodia (*p.*) are proportionately small, but not so small as they are represented in fig. 30, and are placed in a circle occupying the middle of the body; each parapodium has a basal portion and a smaller terminal portion. The suckers are placed a little to the outside of the parapodia. They are prominent and hemispherical in form and radially furrowed. The margin of the mouth (*ph.*) is prolonged beyond the surface of the body into a small tube equal in height to the suckers; a number of papillæ belonging to the pharynx project from its aperture. The large cloacal papilla (*cl.*) lies in the middle between the parapodia and the margin of the body. The latter is provided with probably twenty short tubercle-like cirri.

Besides this specimen, collected during the Challenger Expedition, I have another individual from the Copenhagen Museum, which is no doubt a younger stage of the same species. It is only 3 mm. long, of a uniform greyish-brown tint, with all the characteristic markings present though not so distinct. The rows of tubercles on the back are far smaller, and can only be seen by the help of a lens; also they do not differ in colour and consistency from the rest of the skin of the back.

Hosts.—(*a*) Probably *Antedon incisa*, P. H. C., or *Antedon inæqualis*, P. H. C., from Station 174 of Challenger Expedition (south-west of the Fiji Islands).

(*b*) *Actinometra mutabilis*, Lütken, MS., from the Copenhagen Museum. Dredged by Captain Andréa in 17 fathoms; lat. 23° 20′ N., long. 118° 30′ E.

6. *Myzostoma alatum*, Graff (Pl. I. figs. 25–29).

Myzostoma alatum, Graff, Proc. Roy. Soc. Edin., vol. xii. p. 379.

I have named this species from the character of the marginal part of the body, which is not unlike the "wings" of certain fruits, *e.g.*, of the elm. This comparison is rendered more striking by the fact that the animal is longer than broad, and slightly notched at the middle of the anterior and posterior margins. Behind the anterior notch is a small cavity with five pairs of depressions; this was caused by the presence of a young individual (fig. 25), which unfortunately was lost. Fig. 28 represents an ideal transverse section, and it may be seen that the central part of the body, strongly convex above, is much thicker than the marginal part, though the latter is not thin enough to be transparent, and there is no defined marginal border. The larger specimen is 3 mm. long, and the smaller 2 mm. The colour of the back is a dirty yellow, inclining to grey upon the ventral surface. The skin of the back is covered by numerous minute conical papillæ, whereas the ventral surface is quite smooth. The parapodia are situated at the periphery of the central elevation (figs. 26, 27); they are extremely small, and consist merely of a circular fold, out of the middle of which projects the brownish-black tip of the hooks. The latter (fig. 29) are only ·09 mm. long, and ·013 mm. broad, but I am not confident of the accuracy of these measurements, since I did not remove the hooks

for fear of damaging the specimen too much. They are distinguished by being strongly bent, and by the blackish colour of the tip. The manubrium (*ma.*) is similar to that of *Myzostoma gigas* (Pl. II. figs. 4, 6), but is not so large in proportion. The round well-developed suckers are without the circle of parapodia, and distant from the margin of the body by only one-sixth of the entire radius. The free ends of the suckers of the smaller individual are more extended, and reach beyond the margin of the body; they are goblet-shaped, and larger than the parapodia.

The pharynx is half drawn out and well-developed; the mouth lies as far from the margin of the body as the suckers. The cloacal aperture is dorsal, and lies on a papilla situated just anteriorly to the hinder margin of the body.

Host.—Antedon phalangium, Müll., sp. Dredged in the Minch, August 14, 1869, and at Station 13 (off Duncansby Head) (1870), lat. 40° 16′ N., long. 9° 37′ W., in 220 fathoms, by the "Porcupine" Expedition.

7. *Myzostoma costatum*, F. S. Leuckart.

Myzostoma costatum, Graff, Genus Myzostoma, p. 11, pl. i. figs. 13, 14.

Professor Hæckel obtained another specimen of this form at Tur near Sinai, which is rather smaller than the examples previously described by me, and of a slightly different form. It measures nearly 2 mm. in length, the lateral parts are bent ventrally and not obliquely sloped from the middle elevation of the back. The breadth is rather greater than the length; the marginal notches are more distinct, the colour yellowish-brown. The "ribs" are not so distinct as in the specimens from Bohol; the anterior notch is not so marked.

Hosts.—(*a*) *Comatula multiradiata*, Lam. (many types have been confused under this name, the host may be either *Antedon savignyi*, Müll., sp., or *Antedon palmata*, Müll., sp.), Red Sea.

(*b*) *Antedon triquetra*, Semper, MS., Bohol (Philippines).

(*c*) *Actinometra parvicirra*, Müll., sp., Bohol (Philippines).

8. *Myzostoma plicatum*, n. sp. (Pl. III. figs. 16–18).

The body is 4 mm. long and circular in shape, but the true form is somewhat concealed by the sides being turned down. The back is sepia brown, and sculptured in a very characteristic manner. Instead of a longitudinal elevation, there is a furrow running along the length of the back; several furrows also run across this, from one side to the other. There are a number of crest-like elevations corresponding to the intestinal cæca; these elevations cause the marginal part of the body to appear stouter than the central (fig. 18). The thickness of the body is somewhat intermediate between that of *Myzostoma cirriferum* and *Myzostoma glabrum*. The whole disk is opaque, and the only

peculiarity of the marginal portion consists in the obtuse prong-like endings of the radial elevations. The skin of the back is finely granular, and has a few scattered tubercles. The ventral side is smooth and greyish-brown coloured. Fig. 17 shows the arrangement of the relatively feeble parapodia (*p.*), as well as of the suckers (*s.*), mouth (*m.*), and cloacal aperture (*cl.*).

Host.—*Antedon tenax*, Lütken, MS., from New Holland, Copenhagen Museum.

9. *Myzostoma rubro-fasciatum*, n. sp. (Pl. II. fig. 32).

The single individual of this species that I have examined I owe to the kindness of Prof. E. Hæckel. The body is 3 mm. long and rather stout, the greatest breadth is 1·7 mm. The body diminishes in breadth towards what I believe to be the anterior extremity, and is only 1·2 mm. in diameter at the region of the second pair of parapodia. The five pairs of parapodia are rather feebly developed, and arranged in two lines equally distant from the margin and centre of the body. The parapodia show no traces of a division into a basal and distal half; the most anterior pair project in front of the margin of the body, while the hindermost pair are removed from the hind margin by about one-third of their length. The length of the parapodia is as much as ·5 mm. Suckers appeared to be present, but I could not make certain of this. Mouth and cloacal aperture are probably terminal, and lie on the ends of two small papillæ, by which the two extremities of the body are distinguished.

The ventral surface is yellowish in colour, flat and finely wrinkled; the dorsal surface, on the contrary, is coloured and sculptured in so marked a way that it is impossible to confound this species with any other. The central elevation is well-marked, especially in the posterior half; it is joined to eight pairs of lateral elevations, ending at the margin of the body in obtuse notches; between these are here and there indications of secondary elevations, which commence in obtuse prongs, but are not prolonged far towards the centre. The last pair of lateral elevations are continued into two tentacle-like structures, which measure ·6 mm. from base to tip. The animal is also readily distinguishable by its colour. Two dark-red bands run on either side of the median elevation from one end of the body to the other; two less brightly coloured bands run near the lateral margins of the body. There are no tubercles nor cirri present.

Host.—Uncertain. Obtained by Prof. Hæckel at Tur near Sinai, in the Red Sea.

10. *Myzostoma glabrum*, F. S. Leuckart.

Hitherto found in the European seas, but only on *Antedon rosacea* (*Comatula mediterranea*, Lam.), *cf.* p 12, and Genus Myzostoma.

11. *Myzostoma gigas*, Lütken (Pl. II. figs. 1–8).

Myzostoma gigas, Lütken, MS.
„ „ Graff, Proc. Roy. Soc. Edin., vol. xii. p. 378, 1884.

In the year 1877 I received from Dr. Lütken some Myzostomida from the Copenhagen Museum, which on account of their large size had been named by him *Myzostoma gigas*.[1]

This species measures 7 mm. in diameter, the thickness of the body reaching 1·5 mm. in the middle; the back is convex, increasing gradually from the margin, and the animal appears therefore lenticular; the ventral surface is flat. At the extreme edge the body is transparent, and becomes more and more opaque towards the centre. The dorsal surface is covered with tubercles, distinguishable by the naked eye, and separated from each other by intervals (fig. 3), which become smaller and smaller, and finally disappear at the margin of the body. The latter is provided with twenty long, equal cirri, measuring ·16–·2 mm., and arranged at equal distances from each other, except the first pair, which are rather further removed from each other than the succeeding cirri. Each cirrus arises in a small marginal notch. The parapodia (figs. 1, 2, *p.*) are stout, and arranged in a circle at equal distances from the centre and the periphery. Each parapodium has a number of annular furrows and a strong terminal hook-apparatus. The hooks, which are furnished with a fine somewhat bent tip (figs. 4, 5, 6, *u.*), are from ·2–·26 mm. long, and ·01–·02 mm. thick. The manubrium (*ma.*) is a convex plate, with five or six digitiform processes on its free margin. The inequality in length between the stalks of the manubria is very striking. Two of them taken from the same individual measure respectively ·26 and ·15 mm. in length. The suckers (*s.*) are hemispherical, and very large, and situated between the insertions of the parapodia and the margin of the body; they bear a number of incisions round the edge. The pharynx (*ph.*) is small in proportion to the body; the mouth (*m.*) and cloacal papilla (*cl.*) lie at the same level as the suckers, at a considerable distance from the margin.

The male genital papilla (♂) is also remarkably large. All the other specimens that I have are much smaller than those from the Copenhagen Museum, and differ also in their colour, which varies from light yellow to red-brown. The margin of some of the smaller specimens is also more transparent and more marked off from the rest of the disk, especially in a specimen from the Amsterdam Museum, collected during the Dutch Arctic Expedition, which comes nearest in size to the specimens in the Copenhagen Museum. The smallest specimens of all were gathered during the Challenger Expedition. One of these is displayed in figs. 7, 8; it was taken at Bahia, from *Antedon carinata*, and is of a

[1] Dr. Chr. Fr. Lütken, A revised Catalogue of the Annelida and other not Entozoic Worms of Greenland, p. 178, No. 120, *Myzostoma gigas*, Ltk. (MS.), in Manual of the Natural History, &c., of Greenland, edited by Prof. T. Rupert Jones, for the use of the Arctic Expedition, London, 1875.

brownish-yellow colour. Not only is the marginal area of these specimens more transparent, but also the skin of the back, from absence of pigment, and the base of the hook-apparatus is plainly visible through it. This specimen, which is 2·5 mm. long, has an oblong cavity in the middle of the back, from which radiate a number of fine furrows, separating the parapodial sectors from each other. The dorsal tubercles are visible, but much smaller than in the larger individuals. In another specimen also from *Antedon eschrichti* (Station 48), 1·6 mm. long, the dorsal tubercles were scarcely visible, even with a lens.

Hosts.—(*a*) *Antedon eschrichti*, Müll., sp., from north Greenland (Prövenl), found in 50 fathoms, by the late Director Olrik, Copenhagen Museum.

,, ,, from Jan-Meyen, by Norwegian Arctic Expedition, Bergen Museum.

,, ,, "Porcupine," 1869, 60° 14′ N., 6° 17′ W., 632 fathoms. The specimen could not with certainty be set down as *Myzostoma gigas*.

,, ,, from 76° 51′ N., 44° 20′ E., 145 fathoms; Station 21 (September 7th) of the Dutch Arctic Expedition.

,, ,, or *Antedon quadrata*, P. H. C. Station 48 (Le Have Bank) of the Challenger Expedition.

,, ,, from 74° 71′ 4″ N., 50° 23′ E., 84 fathoms; Station 21 (July 7th) of the Dutch Arctic Expedition.

(*b*) *Antedon carinata*, Leach, sp., Bahia, Challenger Expedition.

12. *Myzostoma testudo*, n. sp. (Pl. I. figs. 18–24).

I examined two specimens of this species; one measured 4 mm. in length, the other 2·5 mm.

The larger individual has much the appearance of an oval thickish plate, the margin of which is bent ventrally in such a manner that the animal appears of a convex lenticular shape from above, and concave from below. Its colour is a light sepia brown; the back is sculptured in two different ways, being covered by a number of small tubercles, and also divided by furrows into larger areas, so that it has much the appearance of tortoise-shell. Two longitudinal furrows enclose a central area (figs. 18, 19), which gradually dies away, but again increases at the hinder margin of the body, the latter portion being separated off from the rest by a furrow; this middle area has the appearance of a goblet with a broad base. There are also on either side five oval elevations arranged in a semicircle; these look at first sight as if they were ten small individuals, but a closer examination shows that they are merely elevations, covering the basal ends of the hook-apparatus (*cf.* Genus Myzostoma, pl. viii. fig. 2). There are twenty cirri present, each of which is

situated in a shallow excavation on the margin of the body. The ventral surface is sculptured like the dorsal into polygonal areas, which are, however, irregular in size and form. The central muscular mass is marked by a low elevation (figs. 20, 21).

The parapodia (*p.*) are fully developed and situated at about two-fifths of the whole radius from the margin of the body; their muscles, especially the musculus centralis, are not strongly developed, as is also shown by the absence of radial elevations on the ventral surface of the body corresponding to them. The hook (fig. 24, *u.*) ends in a fine short point, bent so little that it only forms an obtuse angle with the axis of the stem (·013 mm. large). The manubrium (*ma.*) has a large stalk, which is of equal size throughout its whole length. At the extremity it is obtuse, and ends in two irregular swellings directed backwards. The hemispherical suckers (fig. 20, *s.*) are small, but project somewhat.

The mouth (*m.*) is placed very far back, nearly on a level with the insertion of the parapodia; the pharyngeal tube (*ph.*) projects from it; nearer to the margin than the mouth is the cloacal papilla (*cl.*), at the posterior end of the body.

The male genital papillæ (♂) are high cones with broad bases. They are considerably larger than the parapodia, close to which they lie.

The smaller individual is remarkably different from the one just described. It is oblong in shape instead of circular (fig. 23), and less convex on the dorsal surface; the portion of the body outside of the five pairs of elevations is gradually bent downwards. The median area lies in the same plane with these elevations, which are flattened and enlarged to five-sided masses, looking just as if the animal had been subjected to considerable pressure. The tubercles in the same way are flattened and polygonal, touching one another on all sides. The resemblance to tortoise-shell is almost more striking, since the median area is divided up by several transverse furrows.

In other respects the two individuals agree, and since they came from the same host, I do not doubt that they belong to one and the same species.

Host.—Actinometra lineata, P. H. C. Station 285 (Barbados) of the "Blake" Expedition.

13. *Myzostoma lütkeni*, n. sp. (Pl. II. figs. 20, 21).

This unique specimen from the Copenhagen Museum measures rather more than 3·5 mm. long and 3 mm. broad. The anterior margin is slightly notched, so that the contour is almost heart-shaped. The body is very compact and quite opaque. The dorsal surface is greyish-brownish-black in colour, and divided by deep and shallow furrows, with numerous irregular areas like the bark of a tree. The cirri are twenty in number, 0·6 mm. long, and arranged at equal distances from each other, except the first pair, which are separated by an interval double as great as that between the others. The ventral surface is very characteristic. All the usual elevations are distinctly seen. The parapodia and suckers are well developed; the latter project between the parapodia

as tubes with a crown of tubercles. All the elevations are marked out from the peripheral part of the ventral surface, which is blackish-brown, by their light yellow-brown colour. The peripheral portion is also bent upwards and radially furrowed in correspondence with the intestinal cæca. Through the mouth, at the anterior margin of the central elevation, projects the pharynx, which is provided with a subterminal crown of papillæ of ·18 mm. in length. The obtusely conical cloacal papilla at the hinder end of the ventral mass is further removed than the mouth from the margin of the body. The parapodia and suckers project equally at the commencement of the distal half of the radius.

Host.—Actinometra intricata, Lütken, sp., from Tonga, Copenhagen Museum.

14. *Myzostoma pallidum*, Graff.

Myzostoma pallidum, Graff, Genus Myzostoma, p. 18, pl. ii. figs. 6, 6*a*.

Hosts.—Actinometra solaris, Lam., sp., and *Actinometra parvicirra*, Müll., sp., from Bohol (Philippines).

15. *Myzostoma marginatum*, n. sp. (Pl. II. figs. 16–19).

The body is nearly circular in form and 2 mm. in extent; both dorsal and ventral surfaces are alike of a yellowish-brown colour. The former is somewhat vaulted, and appears irregular on account of several deep furrows and a number of tubercles arranged close together and of various sizes; these are only absent from a narrow transparent piece round the margin (fig. 16); the margin is provided with cirri ·18 mm. long. I was not quite certain about the number, but it seemed probable that they were limited to twenty. On the ventral side the margin of the body with its cirri is yet more conspicuous; the ventral muscular mass is of a considerable size (*cf.* ideal cross section, fig. 19).

The parapodia (fig. 18, *p.*) are of moderate size, and divided into an extremely fine terminal segment and a thicker basal part. Close to the third pair of parapodia are the conspicuous male genital papillæ (♂). The parapodia occupy a circle nearly mid-way between the centre and margin of the body; the circular suckers (*s.*) lie on the same level with the free ends of the parapodia. The oral and cloacal apertures are on the margin of the ventral muscular mass; the latter is a simple opening without papillæ. The small elevation behind the mouth shows that the pharynx is insignificant in size.

A small yellowish-brown individual, dredged at Martinique (Station 203) by the "Blake," is probably of the same species. This specimen is 1·2 mm. long, and has all the characters of the species, but less sharply marked. There are ten pairs of cirri, arranged in regular order, the largest of which measured ·1 mm. The terminal segments of the parapodia are sharply marked off from the basal as little button-like portions.

Host.—Actinometra discoidea, P. H. C., from Station 155 (Montserrat) of "Blake" Expedition. In this case the parasite was attached to the host. I have also a specimen

from Station 203 (Martinique), where *Actinometra discoidea* also occurred; but as the parasite was unattached, it may have belonged to one of the other *Comatulæ* occurring at this Station (*Actinometra meridionalis?*).

16. *Myzostoma brevipes*, n. sp. (Pl. III. figs. 19, 20).

In size and stoutness of build this species is intermediate between *Myzostoma glabrum* and *Myzostoma cirriferum;* it has, like the latter, a transparent marginal border, from which arise twenty short cirri, ·16 mm. long. The back is a bright gamboge-colour, and covered by deep folds; the larger of these were no doubt caused by the alcohol, but the finer peripheral folds correspond to the branches of the intestine. The flat ventral surface is a dull greyish-brown; the parapodia take their origin from small cavities on the ventral surface (see ideal section, fig. 20). They are, however, feeble and short (·18 mm. long), and reach but a little way beyond the margin of the cavities. Beyond the latter are traces of flat suckers. The diameter of the disc in the largest specimen is 2·3 mm.

Host.—Antedon pourtalesii, P. H. C., from Station 241 (off Carriacou) of the "Blake" Expedition.

17. *Myzostoma carpenteri*, Graff (Pl. II. figs. 10–15).

Myzostoma carpenteri, Graff, Proc. Roy. Soc. Edin., vol. xii. p. 380, 1884.

The adult individuals of this species, which I name in honour of my friend Dr P. Herbert Carpenter, are of a light yellow colour with fine wrinkles. The body is robust, and is everywhere of considerable thickness, as shown by the ideal section (fig. 14). The anterior margin is somewhat indented, the hind margin obtusely pointed; the diameter is somewhat greater than the length, and measures 2·3 mm; the shape of this species is therefore quite characteristic. On the margin are twenty cirri, the last pair of which are more distant from each other than the others. The bases of the cirri are broad, with a number of annular folds; the whole margin of the body is feebly excavated at intervals. The length and breadth of the cirri in the two individuals that I examined was quite different. In the one (fig. 13) they reach ·09 mm., in the other ·16 mm.

The parapodia are situated near the margin of the body (fig, 11), but are feebly developed; the short basal portion lies in a flat cavity, and the thin terminal part alone, which measures ·2 mm. and is often curved, is visible beyond it. The suckers are still nearer to the margin, and just as little developed. On the dorsal surface is a sharp keel, and on the ventral side, corresponding to it, is a more obtuse and less prominent keel (fig. 14). There is no trace of the central ventrally placed elevation, and as the pharynx also is marked on the outside by no elevation, it may be safely concluded that it is of small dimensions. I discovered the mouth after a laborious search; it is a fine slit on the bottom of the anterior notch of the body, and looks forwards and downwards; its margin is not at all thickened. The cloacal aperture is still more minute, and lies at the hindermost extreme of the body.

On the dorsal surface of the adult individual there was attached a young specimen (fig. 15), ·46 mm. long and ·5 mm. broad, delicate and transparent, with the marginal border extended into twenty long processes, the largest of which measured ·06 mm. The position of the mouth and cloaca (*m.*, *cl.*), and the feeble indication of the suckers (*s.*), seem to show that it is a young specimen of *Myzostoma carpenteri*, though I am fully aware that the young of *Myzostoma cirriferum* are characterised by a similar position of the mouth and cloaca. But in individuals of the size of the one displayed in fig. 15, the primary terminal position of these apertures is lost (see Genus Myzostoma p. 66), so that in this case it is lawful to draw a conclusion about the species to which this individual belongs. The relatively large size of the parapodia and pharynx of this young specimen is not of great importance, since in *Myzostoma cirriferum* and *Myzostoma glabrum* these organs do not grow so fast as the disk.

Host.—*Antedon dentata*, Say (=*Antedon sarsii*, D. and K.), from Station 5 (August 10, 1882) of the "Triton" Expedition, in 285 to 433 fathoms.

18. *Myzostoma areolatum*, n. sp. (Pl. III. figs. 1–3).

The largest of the five individuals that I examined measures 1·5 mm. in length and ·9 mm. broad. The body is of an opaque brown, like leather, and flat above and below; the margin is thinner than the median part, which is rather prominent on the ventral aspect (see ideal section, fig. 3). The dorsal surface is divided by a number of furrows into polygonal areas (fig. 1) of four sides, which are largest in the middle, and owing to the longitudinal course of the larger furrows are grouped lengthways. Towards the margin the furrows become shallower and more irregular, and the areas smaller, till close to the margin the surface is covered by small wrinkles, which cause the edge to be slightly notched. The cirri are represented by twenty unequal tubercles (fig. 2, *c.*), which almost disappear in some individuals. As in *Myzostoma glabrum*, the sexual organs and intestinal cæca do not extend beyond the ventral elevation, at the anterior extremity of which is the mouth (*m.*), and at the posterior the cloacal opening (*cl.*). The bulbus musculosus of the pharynx (*ph.*) has a length of nearly one-third of that of the body. The parapodia (*p.*) are short and strong, ending obtusely. The oval suckers (*s.*) lie in the ventral elevation, removed from the margin by a distance equal to their own length.

Hosts.—(*a*) *Actinometra blakei*, P. H. C., from Station 172 (Guadeloupe) of the "Blake" Expedition.

(*b*) *Actinometra meridionalis*, var *quadrata*, P. H. C., from Station 203 (Martinique) and Station 278 (Barbados) of the "Blake" Expedition.

19. *Myzostoma triste*, Graff.

Myzostoma triste, Graff, Genus Myzostoma, p. 19, pl. ii. fig. 5.

Of this species, already described by me, I received three specimens from the Copen-

hagen Museum. They were all of equal size, about 3·5 mm. long, and differed from the Bohol specimen in their yellowish-brown colour, opaqueness, and larger size. One specimen had the dorsal surface finely granulated; and a renewed examination of the specimen from Bohol, formerly described by me, showed granulations here and there.

Hosts.—(*a*) *Actinometra parvicirra*, Müll., sp., from Bohol (Philippines). (*b*) Uncertain. The Copenhagen specimens were taken from Crinoids (*Actinometra*, *Antedon*) from the central part of the Southern Sea (Tahiti, Samoa, &c.), but no more exact statements can be made. Two other smaller individuals (2·27 mm. long) I got from an undetermined species of *Comatula* from the British Museum. The locality, however, was unknown.

20. *Myzostoma coriaceum*, n. sp. (Pl. XI. figs. 1–3).

By the permission of Dr. A. Günther, I received from Prof. Jeffrey Bell three specimens of a *Myzostoma* found by Mr. P. H. Carpenter on an *Antedon* (*Antedon insignis*, Bell, MS.) dredged during the "Alert" Expedition; this is the largest species known to me. The diameter of the circular body is about 9 mm., and as the margins are bent down, the animal must really measure as much as 1 cm. when fully extended. The colour is a darkish brown, only a marginal zone about ·3 mm. wide being of a somewhat lighter colour, but not in the least transparent. The dorsal surface has irregular folds, caused no doubt by the alcohol; the skin is smooth and without tubercles. The consistency of the body is very much that of leather, but the thickness is inconsiderable,—this species is in fact almost the thinnest known, as may be seen from the ideal cross section (fig. 3). The margin of the body has twenty cirri, measuring from ·23–·3 mm. in length, and it is a curious fact that the smallest specimen, 2·7 mm. in diameter, has cirri proportionally far larger; they measure about ·22 mm. long. The parapodia (*p.*) are near the centre of the ventral surface at about the end of the inner third of the radius. From the external margin of their insertion to the tip they measure about ·7 mm., and are in consequence relatively small. Slightly outside of the parapodia, about half-way between the margin and the centre of the body, are the prominent rounded suckers (*s.*), ·3 mm. in diameter; they are conspicuous by the fine folds on their free surface. At the same level as the suckers are the oral (*m.*), cloacal (*cl.*), and two male genital (♂) apertures; the latter are situated at the extremities of papillæ considerably larger than the parapodia.

Host.—*Antedon insignis*, Bell, MS., from Station 110 (Port Denison, 3 to 4 fathoms) of the "Alert" Expedition, British Museum.

21. *Myzostoma radiatum*, n. sp. (Pl. III. figs. 12, *A*, *B*).

The form of this species is very peculiar; the back is flat, while the ventral surface is vaulted (see ideal cross section, fig. 12, *B*). Seen from below (*A*) this massive swelling is intersected by ten radial furrows, dividing up its area into as many sectors, each of which

becomes larger towards the margin, and bulges slightly forward. In the middle of the outer extremity of each of these is a small conical tubercle—the parapodium—which is at the most ·1 mm. long. The third sector is slit on both sides by a secondary furrow, in which lies the parapodium as well as the male genital aperture; there are two fine tubercles also occupying the tip of the secondary prongs. The flat suckers are at the external margin of the ventral elevation, in the chief furrows and closer to the dorsal portion. Just beneath the marginal zone of the dorsal disk are the mouth and cloacal apertures. The long pharynx is much extended forwards and flexed towards the dorsal aspect. The ventral surface is rather lighter in colour than the back, and not so smooth, but divided by shallow furrows into a number of polygonal areas about ·07 mm. in breadth.

Host.—The single specimen was found on an *Actinometra*, closely allied to, if not identical with *Actinometra meridionalis*, A. Ag., dredged by Capt. Werner in 1873, near Barbados; it belongs to the Kiel Museum.

22. *Myzostoma pulvinar*, Graff (Pl. III. figs. 21–23).

Myzostoma pulvinar, Graff, Proc. Roy. Soc. Edin., vol. xii. p. 379, 1884.

This species, of which I possess only one specimen, is very much like *Myzostoma radiatum*; the dorsal surface in both species is flat and the ventral surface vaulted. The oral and cloacal apertures, however, differ in being on the dorsal surface. This latter is formed by a transversely oblong plate, marked off sharply from the rest of the body; the margin of which is bent upwards in front and at both sides, but downwards behind (fig. 21). The diameter of this dorsal disk, which is quite smooth, save for the reflected portions that are slightly wrinkled, is 3·2 mm., the length 2·7 mm. The obtusely pointed cloacal papilla is ·45 mm. distant from the hinder end of the body; the mouth has a thick lip, and is not so far from the anterior end of the body as the cloacal papilla. The massive pharynx protrudes from the mouth. The body is of a firm consistency; the colour is a uniform yellowish-brown.

This species is thicker in proportion than any other; there is only a narrow marginal zone not occupied by the hugely developed ventral elevation. The anterior and posterior borders of this elevation are parallel, the distance between them being 2·3 mm.; the sides are rounded, the transverse diameter being 3·4 mm. The ventral elevation is distinctly marked off from the dorsal disk by its considerable cross extension, and it is very prominent when observed from above.

The parapodia arise from the margin of the ventral elevation; the anterior pair being situated at the junction between the straight anterior and the rounded lateral margin. The parapodia are at equal distances from each other, and it is only the last pair which are separated by a somewhat wider interval. The parapodia appear as if they were almost immovable; the hook apparatus is strongly developed and projects greatly; in the specimen that I examined it projected ·2 mm., and even the point of the manubrium came

out beyond the parapodium. Fig. 23 represents the portion of the hook-apparatus which extends beyond the parapodium. This part of the hook is ·2 mm. long and ·02 mm. broad; the end is bent at more than a right angle and gracefully curved. There is no separate manubrial plate—the end of the manubrium merely becomes thinner, more flattened, and bent backwards, so that it embraces nearly the whole hook (*ma.*). The whole manubrium is covered by numerous tubercles, which show the powerful development of its muscular system. These chitinous parts are of a deep dark yellow and yellowish-brown where the light falls upon them. I have not succeeded in finding any trace of suckers.

Host.—The single specimen was found upon the peristome of *Antedon phalangium*, Müll., sp., dredged in the Minch, from 60 to 80 fathoms, August 14, 1869, by H.M.S. "Porcupine."

23. *Myzostoma calycotyle*, n. sp. (Pl. III. figs. 24–26).

The colour of the animal varies from dirty grey to brownish; the shape of the body is oblong, the diameter being 3·6 mm., and the length 2 mm. The convex dorsal surface is covered with small scattered whitish papillæ, while the concave under surface is much bent and folded. The margin is beset with numerous cirri of ·2 mm. in length, and considerably bent upwards (fig. 24). The shape of the specimen renders an examination of the ventral side very difficult. A portion of the parapodia and suckers are squeezed into the furrows, so that it is quite impossible to examine them properly, which is much to be regretted, since the type is an interesting one. In the first place, the suckers are not situated, as is usual, between the parapodia, but arise quite near their base (fig. 26). The suckers (*s.*) are distinguished by being very strongly developed; their shape is also peculiar; they closely resemble stalked goblets, and their greatest diameter is ·34 mm. The relation of the two anterior pairs of suckers to the parapodia may be seen in the specimen; they lie, with respect to the short axis of the body (fig. 25), outside the parapodia (*a.* and *b.*), but joined to them. It may therefore be safely concluded that the shorter diameter represents the longitudinal axis. The only opening that can represent the mouth falls within this line, between the two suckers and parapodia (fig. 25, *a.* and *b.*). This mouth opening is then rather dorsal in position (fig. 24, *m.*). I did not discover the cloacal opening.

Host. — *Pentacrinus alternicirrus*, P. H. C., from Station 214 (south of Philippine Islands) of the Challenger Expedition.

24. *Myzostoma compressum*, n. sp. (Pl. III. figs. 4–8).

This species is distinguished by its yellowish-brown colour and laterally compressed shape (see ideal section, fig. 7); the back runs up like a keel, which is considerably higher than the animal is broad. The skin of the back is quite smooth; the margin of the body, as I observed in a specimen preserved by v. Willemoes Suhm, is provided with twenty cirri, resembling very closely in size those of *Myzostoma coronatum;* the largest are ·2 mm. long.

The parapodia (fig. 5) are relatively feeble, and approximated to the flat margin of the ventral surface; the strong flexure of the hooks (*u.*) and the manubrial plate (*ma.*) is shown in fig. 4; the suckers, which I only saw in v. Willemoes Suhm's preparation, are small, oval, and flat. The length of the ventral disk is 2·3 mm., the breadth 1·2 mm.; the mouth is subterminal, and the pharynx provided with a very long bulbus musculosus; the cloacal opening is terminal.

Host.—Bathycrinus aldrichianus, Wyv. Thoms., from Station 146 (Prince Edward Island, Crozets) of the Challenger Expedition.

25. *Myzostoma brevicirrum*, n. sp. (Pl. VI. figs 3, 4).

The largest of the six specimens which I had at my disposal was ·5 mm. in diameter, and had the form of a transparent circular yellowish plate. The eggs were fully developed; the spermatic vesicles and vasa deferentia were quite full of spermatozoa, showing that the individual was an adult.

One of the specimens is brown, but this colour is probably due to the pigments of its host dissolved in the alcohol. The marginal border measures ·015 mm. across, and is provided with short wart-like cirri, measuring about ·01 mm. and situated at even distances. The alimentary canal is not remarkable; the pharynx has a large bulbus musculosus, and is provided with papillæ. The oral and cloacal apertures lie between the centre and margin of the body. The round suckers, ·01 mm. in size, lie at the commencement of the exterior third of the radius. The strongly developed parapodia lie between the middle and border of the body. The hook-apparatus is feeble; the hook is ·09 mm. long (fig. 4, *u.*) and the manubrium (*ma.*) ·07 mm. long, provided with a single end plate.

Since in individuals of ·24 mm. diameter the vasa deferentia and the seminal vesicles are filled with spermatozoa, whereas the eggs are but little developed, it may be concluded that the male apparatus is earlier developed than the female.

Host.—Actinometra mutabilis, Lütken, MS., from the Copenhagen Museum (No. I. from 23° 20′ N., 118° 38′ E.; 17 fathoms; No. III. from Tonga.).

26. *Myzostoma pictum*, n. sp. (Pl. II. fig. 22).

The fine markings on the back of this species are sufficient to recognise it by, though the rolled-up condition of the single specimen did not allow of any exact examination into the conditions of the ventral side. I am only able to state that the parapodia are but feebly developed, and are merely small stumps of ·1 mm. in length, situated in slight depressions of the integument, and hardly recognisable even by the help of a lens.

In the middle part the body is nearly as stout as in *Myzostoma cirriferum*, but becomes gradually thinner towards the marginal border, which is therefore not distinctly separated from the central part, although it contains none of the intestinal branches; it is indeed semitransparent, but of the same consistency as other parts of the body. On the dorsal surface are three prominent pale yellow coloured longitudinal bands; the median one is

the largest, and from it are seen to radiate outwards a number of yellow coloured marks which correspond to the intestinal cæca. The intervals between the longitudinal bands are brownish coloured, and the intervals between the lateral ramifications are greyish-brown, becoming darker towards the ends of the lateral branches. The margin of the dorsal disk is bordered by a yellowish band. The transverse diameter of the body is 1·8 mm.

Host.—Probably *Antedon spinifera*, P. H. C. From Station 157 (Montserrat) of the "Blake" Expedition.

27. *Myzostoma nigrescens*, n. sp. (Pl. III. figs. 13–15).

In size, number, and arrangement of cirri, and in general appearance, this species much resembles *Myzostoma cirriferum*, differing only by its smaller length (2·5) and by not having a translucent marginal border. The body of the single individual that I was able to examine is coloured blackish-brown above, and below a little lighter coloured; it is thick not only in the middle of the body, but also at the margin; it is therefore hardly at all translucent. The parts of the hook-apparatus (fig. 14) are also much more strongly developed; the hook (*u.*) is provided with a straight extremity set at right angles to the rest of the shaft; it is ·17 mm. long and ·016 mm. thick. The manubrium (*ma.*) is short, measuring only ·12 mm. long; the terminal plate is distinguished by its smooth surface and bent edge.

Of the twenty cirri the anterior pair are the largest, and measure ·45 mm.; the rest are much shorter (·27–·35 mm.). The third cirrus on the left side shows an abnormality already noticed by me in *Myzostoma cirriferum* (Genus Myzostoma, p. 79); it is forked at the extremity, one of the ends being short and stump-like, the other long.

Host.—Actinometra morsei, P. H. C. Found by E. S. Morse in Yeddo Bay (Japan); the property of the Museum of Comparative Zoology, Cambridge, Mass.

28. *Myzostoma cirriferum*, F. S. Leuckart.

Hosts.—(*a*) *Antedon rosacea.*—Mr. P. H. Carpenter has specimens from Shetland (Bressay Sound, 5 to 7 fathoms), and Arran (5 to 10 fathoms), which confirm the assertion that this parasite occurs in all European seas where its host occurs (see Genus Myzostoma, p. 79).

(*b*) *Antedon petasus*, P. H. C.—Mr. Carpenter has specimens from Norway, the Kiel Museum from Arendal, Norway; and H.M.S. "Triton" dredged some at Station 3 (August 8, 1882, 81 fathoms).

(*c*) *Antedon hystrix*, P. H. C., from North Atlantic (probably cold area), "Porcupine," 1869.

29. *Myzostoma crenatum*, n. sp. (Pl. VII. fig. 4).

This species is one of the most elegant and regular among the flat Myzostomida. The

body is perfectly circular, thin, brownish-yellow coloured with a broad transparent marginal zone. The largest of the three specimens is 1 mm. in diameter, the smallest ·6 mm. There are twenty thick obtusely pointed cirri of equal length (in the larger specimen ·9 mm., in the smaller ·056). Their bases are continued for some way into the interior of the disk. In the intervals between the cirri, the margin of the body is prolonged into rounded lobes. The parapodia (*p.*) are comparatively well-developed, and are arranged in a circle at about the inner third of the radius; outside are the large oval suckers (*s.*), distant from the margin about their own length. The mouth (*m.*) and cloacal aperture (*cl.*) lie at the same level as the suckers. The pharynx (*ph.*) is well-developed; the male genital papillæ (♂) form two tubes of the same length as the parapodia, and reaching to the margin of the body.

Host.—This species was found in bottles containing Crinoids collected at Station 203 (Martinique) of the "Blake" Expedition, and in bottles containing Crinoids dredged by the American telegraph steamer "Investigator," under the command of Captain Cole, near St. Lucia, in lat. 13° 22′ N., long. 61° 7′ W.; 278 fathoms. (Both belong to the Museum of Comparative Zoology, Cambridge, Mass.) From P. H. Carpenter's list of the Crinoids dredged at these two Stations it appears that *Actinometra meridionalis*, A. Ag., is the only species that occurs at both Stations, hence it is probably the host of *Myzostoma crenatum*.

30. *Myzostoma wyville-thomsoni*, n. sp. (Pl. VI. figs. 1, 2).

Both the specimens that I had in my possession were much damaged, and fig. 1 is therefore "restored." This species is thin and fragile, and of a dirty-white colour. In the middle it has the thickness of a small *Myzostoma cirriferum*; the portion lying outside the suckers, which are placed very far inwards, is delicate and transparent; there is, however, no precise line of division between the two. There are twenty strongly developed cirri, the first and second pairs of which are situated at a greater distance from each other than the rest, and are remarkable for their large size (as much as ·6 mm. long); the base is continued into the ventral surface. The body is oval, and 2·3 mm. long by 1·7 mm. broad. The parapodia (*p.*) are somewhat remarkable; they are ·7 mm. in length, and the large basal part, which includes the manubrium and its muscles, is sharply marked off from the narrow terminal portion, which is often bent or rolled. It is very clear that the slender hook emerges from the distal end of the basal portion and not from the terminal portion, since the latter is furrowed and not tube-like; the hook lies in this furrow, but emerges from it when it commences to be twisted. The largest hooks measure ·015 mm. thick and ·56 mm. long; they are clear and transparent. The tip is rather bent and somewhat swollen at the anterior end before the bending (fig. 2); this is the thickest portion of the whole hook. The mouth (*m.*) lies a little outside the circle of the suckers; the pharynx (*ph.*) is nearly one-third of the entire length of the body. The branches of the intestine and the genital apparatus I did not see.

Host.—(*a*) *Metacrinus costatus*, P. H. C., n. gen. and sp., from Station 214 (south of Philippine Islands) of the Challenger Expedition (500 fathoms).

(*b*) Another specimen was found by Mr. Carpenter attached to the anal tube of *Metacrinus angulatus*, P. H. C., n. gen. and sp., from Station 192 (south-west of Papua) of the Challenger Expedition. It was 3 mm. in length, and the bulbus musculosus of the pharynx measured ·9 mm. in length.

31. *Myzostoma vastum*, n. sp. (Pl. VII. figs. 2, 3).

The four specimens which I examined came from *Actinometra japonica*, and belong to the Leyden Museum. They are characterised by the smallness of the marginal border, due to the extension of the intestinal cæca (*i.*) and the ovarian follicles (*ov.*) nearly as far as the margin, and by the larger size of the twenty cirri. The first, second, ninth, and tenth pairs of cirri are the longest, especially the ninth, which in the specimen displayed in fig. 2, measure ·6 mm. in length and ·068 mm. in diameter at the base. The third and the eighth pairs are the shortest, and measure no more than ·2 mm. The large oval flat suckers (*s.*) stand at the same level as the ends of the parapodia; the parapodia are strongly developed. The cloacal aperture (*cl.*) lies at the same height as the external margin of the suckers, but the oral aperture is beneath the anterior margin when the pharynx is contracted. In the specimen figured, however, the pharynx is extended, showing its crown of papillæ, and so the appearance is different, since the mouth opening is so much enlarged that its posterior margin is withdrawn further inwards into the disk of the body.

The colour of the animal is lightish brown, inclining to yellow towards the margin; the body is about as thick as in *Myzostoma cirriferum*. The largest specimen measured 1·7 mm. long by 1·47 mm. broad. In one individual the dimensions of the cirri were somewhat different from the description given; the last pair appeared to be extremely shortened, shorter than the lateral cirri, and one had an abnormal lateral branch (fig. 3).

Two smaller specimens, dredged during the "Blake" Expedition, appeared from their general configuration to belong to this species. The ten pairs of cirri were of equal length, and arranged at equal distances from each other; one specimen (host uncertain) was ·7 mm. in length, with cirri of ·056 mm. in length; the other (from *Actinometra meridionalis*) was ·97 mm. in length, and the cirri ·136 mm. The last specimen had its pharynx fully extended and crowned with a circlet of papillæ.

Host.—(*a*) *Actinometra japonica*, Müll., sp., from the Leyden Museum.

(*b*) *Actinometra blakei*, P. H. C., from Station 39 of the "Blake" Expedition. The same species of *Myzostoma* was also found in the bottle containing the Crinoids collected at Station 203 of the "Blake" Expedition. The fact that *Actinometra blakei* occurred in this bottle, probably shows that it is to be considered as the host of this *Myzostoma*.

32. *Myzostoma agassizii*, n. sp. (Pl. VII. fig. 1).

The body is circular and extremely delicate, and transparent not only in the marginal border, but in the part which lies outside the parapodia and suckers, and contains the intestinal cæca. The margin is provided with twenty cirri, which are very long and drawn out into fine points, and show very distinctly a glutinous cell furrow. The longest cirrus of the individual shown in fig. 1 measures ·57 mm., the diameter of its base being ·06 mm. The last two pairs are the largest, and the interval between them is greater than that between the rest. In another specimen one of the lateral cirri measured ·2 mm., the penultimate (and longest) ·45 mm.

I examined in all twenty-two specimens, which varied from ·3 mm. to 1·4 mm.; they were all light yellow to dark brown in colour; the cirri of the smallest specimens were of equal length, measuring about ·045 mm. and at an equal distance from each other; the tenth pair of cirri become much longer than the lateral cirri in individuals of ·6 mm. in length and upwards.

The small size of the body and the fineness of the cirri give this species a peculiarly elegant appearance; it no doubt moves in great part by undulations of the body, inasmuch as none of the specimens that I examined save the two smallest were without some bendings and foldings of the margin of the body. The parapodia (*p.*) are feeble, and situated nearer to the centre than to the margin; the small oblong, indistinctly-marked suckers (*s.*) are situated far inwards, in the region of the intestinal cæca. The mouth is ventral, and lies on a level with the terminations of the intestinal cæca, while the cloacal aperture is distant from the margin about twice as far as the mouth. The pharynx has a long bulbus musculosus (*ph.*).

Hosts.—This species has at least two hosts, but only one can be mentioned with certainty.

(*a*) *Antedon hageni*, Pourt., dredged by "Bibb" Expedition near Bahia Honda, in 100 fathoms, on May 4, 1868. *Antedon hageni* was also most probably the host at Station 32 (August 1877) of the "Blake" Expedition.

(*b*) *Myzostoma agassizii* was also taken at Stations 155 and 269 of the "Blake" Expedition. *Antedon hageni*, however, occurred at neither of these Stations; the species found in great number at both was *Antedon spinifera*, P. H. C., which, therefore, is probably the host.

33. *Myzostoma dubium*, Graff.

Myzostoma dubium, Graff, Genus Myzostoma, p. 14, pl. ix. figs. 2–5.

Hosts—*Antedon triquetra*, Semper, MS., and *Antedon dubia*, Semper, MS., Bohol (Philippines).

34. *Myzostoma mœbianum*, n. sp. (Pl. VIII. figs. 3–10).

Prof. K. Mœbius sent to me in 1877, together with some sketches and notes, preparations of a *Myzostoma* found by him near Mauritius. Since the preparations were, with the exception of the hook-apparatus, not well preserved, I shall follow in my description Dr. Mœbius' notes.

Length about 1·4 mm., breadth 1 mm., somewhat greater in front than behind, so that the contour is oval. The body is vaulted above and slightly concave below; it is of moderate thickness. The cirri are bluntly terminated, and attain a length of ·09 mm.; they are arranged fourteen on each side with an odd one at either end of the body. The skin (fig. 8) is ciliated. The parapodia (*p.*) are strong and contain a bent hook (fig. 10) of ·17 mm. in length and ·017 mm. in breadth; the manubrium is ·13 mm. long, and the hatchet-shaped end plate (*ma.*) is divided on the margin into five prongs; there are also additional hooks still contained "in their formative sheaths." Of the five pairs of "suckers" figured by Dr. Mœbius, one pair seems to me to be really the male generative apertures (♂). The pharynx is represented in fig. 3 in a contracted state, stretched out in fig. 4; the small ramified intestinal cæca (*i.*) are given off from two main trunks. The mouth (*m.*) and cloacal aperture (*cl.*) lie upon the ventral side, but the latter is about twice as far from the margin as the former. All three specimens were sexually mature, and in fig. 3 are shown the testicular follicles (*t.*) occupying all the body except a small border, as well as some of the numerous ripe eggs (*ov.*).

"The stomach and the intestinal branches are lined with reddish cells, carrying cilia and containing yellow fat globules coloured black by osmic acid. The rectum (fig. 5 represents its epithelium) is divided from the stomach by a circular muscle. The cirri bear fixed hairs (fig. 7). The animal cannot easily be removed, without injury, from the *Comatula*. It is supported by its cirri, which it winds round the pinnules of its host. The colour is reddish and transparent."

Host.—*Comatula*, sp., dredged in 18 fathoms on November 5, 1874, at Fouquet Island, south-east from Mauritius.

35. *Myzostoma elongatum*, Graff.

Myzostoma elongatum, Graff, Genus Myzostoma, p. 13, pl. xi. figs. 1, 2.

Host.—*Antedon triquetra*, Semper, MS., Bohol (Philippines).

36. *Myzostoma verrucosum*, Graff.

Myzostoma verrucosum. Graff, Genus Myzostoma, p. 17, pl. ii. fig. 1.

Host.—*Antedon triquetra*, Semper, MS., Bohol (Philippines).

37. *Myzostoma dentatum*, n. sp. (Pl. IX. fig. 1).

Of this elegant species I have but a single example, which is, fortunately, well preserved. The body is regularly elliptical, 1·9 mm. in length, and 1·25 mm. in diameter. It is thin and delicate, and has a membranous appearance. The central part alone crowned by the bases of the parapodia, is somewhat thicker and of a brownish colour. The outer extremities of the ramified intestinal cæca (*i.*) are distinctly visible, and sharply marked off from this part of the body is the brownish-yellow border, which is ·19 mm. in diameter. Instead of cirri there are a number of obtuse teeth-like serrations upon the border, which measure at most ·136 mm. long; they are irregular in size and number. There are twenty to thirty larger ones, and between them a number of smaller projections, one of which lies in the middle line just at the anterior end of the body, and another in the middle line at the posterior end.

The small rounded suckers (*s.*) lie in the middle of the lateral margins of the body and occupy about one-third of them. The strong parapodia (*p.*) lie entirely within the central part of the body, which is occupied by the intestinal cæca; the broad obtuse terminations are prominent only in some of them. On the margin of the central part above the third parapodium is visible on either side the large vesicula seminalis (*vs.*); on the hinder margin of the central part is the cloaca (*cl.*). The mouth (*m.*) lies quite on the border of the body. The bulbus musculosus (*ph.*) of the pharynx is of extraordinary size—one-third of the length of the body.

Host.—*Antedon bidentata*, P. H. C., from Station 186 (Torres Strait) of the Challenger Expedition.

38. *Myzostoma fimbriatum*, n. sp. (Pl. VI. figs. 5, 6).

I had only one specimen, which measured about 1·8 mm. in length and 1·5 mm. in breadth. Though much damaged it appeared to resemble *Myzostoma cirriferum* in form, colour, size, and arrangement of parapodia and suckers. The suckers, however, are round, and there is a distinct male genital papilla on either side between the third parapodium and the margin of the body, which is about half the size of one of the parapodia. The border of the body is not transparent, and is not so sharply marked off as in *Myzostoma cirriferum*; the twenty cirri are relatively shorter, the largest measuring only ·08 mm. The most striking feature is the tufts of fine hairs, ·02 mm. long, on the margin of the body (5, *a*). They were only well preserved on one part of the specimen; highly magnified (fig. 6) they have the appearance of glass, and are clubbed or bent at the extremity. The insertion of their base into the tissue of the body proves that they are not mere cuticular formations.

Host.—*Antedon eschrichti*, Müll., sp., or *Antedon quadrata*, P. H. C., from Station 48 (South of Halifax) of the Challenger Expedition.

39. *Myzostoma excisum*, n. sp. (Pl. VIII. fig. 2).

This species is characterised by the deep excision of the hinder margin of the body, caused by the prolongation of the lateral parts beyond the cloacal papilla (*cl.*). The body is flat, strong, dark brown in colour, and slightly transparent only upon the marginal parts. The latter are prolonged into ten pairs of obtusely-pointed cirri, of which the last pair occupy the two ends bordering the notch. The hinder half of the body being the largest, the whole animal has a heart-shaped contour. That portion of the ventral surface which is enclosed by the suckers on either side, by the mouth in front, and by the cloacal papilla behind, is rather swollen and marked off from the marginal part. The parapodia (*p.*) are very large and well developed; they are nearly as long as the radius of the body, and project beyond its margin. The large pharynx is protruded considerably beyond the mouth. The length of the specimen, from the anterior end to the cloaca, is ·8 mm., the length of the lateral portions 1 mm. the greatest breadth ·9 mm., the length of the largest cirri ·12 mm. Besides this specimen, which was dredged during the "Blake" Expedition, I examined a smaller one from the Kiel Museum, which measured only ·54 mm. long.

Hosts.—(*a*) *Antedon hageni*, Pourt., dredged by the U. S. S. "Bibb" on the Alligator Reef, in 96 fathoms, May 6, 1868.

(*b*) *Antedon impinnata*, P. H. C., from Mauritius, North Bay, 15 fathoms, belonging to the Kiel Museum.

40. *Myzostoma irregulare*, n. sp. (Pl. IX. figs. 2–5).

I include under this species, so named on account of the irregularity in the formation of the cirri, several forms, the strict affinities of which must be cleared up by future investigation. I shall at present describe every variety.

(A) Fig. 2 represents, without doubt, the type of the species; it was taken at Station 249 (Grenada) of the "Blake" Expedition. There are four individuals, all of which are delicate and yellowish in colour, with a transparent border; there are ten pairs of longer cirri and a number of smaller wart-like secondary cirri arranged singly or in pairs between the others; a single median cirrus (*c.*) is situated at the hind end, and is very characteristic. The specimen figured is ·8 mm. long, ·7 mm. in breadth, and the longest cirrus measures ·12 mm. Another specimen measured 1·2 mm. in length, and 1·1 mm. broad; the cirri were proportionately smaller, though actually larger than those of the last mentioned individual. In none of the specimens belonging to this group could any regularity in the arrangement of the smaller cirri be observed (see p. 8).

The strongly developed parapodia (*p.*) occupy the middle region between the margin and the centre of the body, and the large oval suckers (*s.*) lie between the parapodia and the margin of the body.

The mouth (*m.*) and the cloaca (*cl.*) lie on a level with the ends of the parapodia; the pharynx is well-developed, the intestinal cæca are much ramified. The male genital apertures are upon the summit of a broad obtuse elevation (♂).

(B) The form represented in fig. 3 was taken in the Caribbean Sea ("Blake" Expedition), and differs from A, especially by its dark brownish tint; the male genital papilla is extended into a tube, which is to be explained by the contractility of the structure, and does not therefore imply a specific distinction; the same thing may be said concerning the differences in the length and thickness of the principal cirri and the arrangement of the secondary ones.

(C) A third form (fig. 4) differs only from B by the smaller size of its body, and from A and B by the circular form of the suckers (*s.*), the regular intercalation of the secondary cirri, and the presence of two odd median cirri, one at either extremity of the body (*C* and C_1). Nevertheless, bearing in mind what was said in the Introduction concerning the limitation of species, A, B, and C would appear to be identical.

(D) Two specimens from Tortugas ("Bibb" Expedition), whose identity with the described forms A, B, and C must be considered as doubtful. One of them, represented in fig. 5, is ·4 mm. long, and has twenty obtusely pointed cirri, arranged at equal distances from each other and of the same length (·07–·09 mm.); the odd median cirri are wanting.

(E) Two individuals from Stations 45 and 249 of the "Blake" Expedition, as large as B, belong probably to this species, but they are too much damaged to decide the question.

(F) Finally, there is a small specimen, found by Mr. P. H. Carpenter on a specimen of *Actinometra meridionalis*, A. Ag., sp., in the Copenhagen Museum. This specimen had a feebly developed cirrus behind, and is possibly an intermediate form between A and D. Also the body, which is ·5 mm. long, is provided with abnormally large cirri. On the left side the first to the fifth, on the right the first to the eighth of the cirri are of equal length, about ·09 mm., while the others are shorter, especially six to nine of them on the left side, which measure from ·0087 mm. to ·02 mm. The tenth cirrus of the left and the ninth and tenth on the right are again a trifle larger, measuring about ·03 mm.

Hosts.—The only forms which can possibly be regarded as the hosts of this species are *Actinometra meridionalis*, A. Ag., sp., and *Actinometra meridionalis*, var. *carinata*, P. H. C.

This may be stated with certainty for the forms

(D) "Bibb," January 16, 1869, west of Tortugas.

(E) "Blake," No. 45, 1877–78.

(F) Copenhagen Museum (U. S. Coast Survey, 100 fathoms).

In all these three cases *Actinometra meridionalis*, A. Ag., sp., was the host.

(E) This form was found upon both the mentioned forms of *Actinometra*, from Station 249 (Grenada) of the "Blake" Expedition.

(A) Station 249 (Grenada) of the "Blake" Expedition, probably from *Actinometra meridionalis*, var. *carinata*, P. H. C.

(C) Station 203 (Martinique) of the "Blake" Expedition, probably from *Actinometra meridionalis*, var. *carinata*, P. H. C.

(B) "Blake" Expedition, Caribbean Sea, 1877–78 or 1878–79 (label lost). Nothing can be stated with certainty respecting the host of this form, though it is probably *Actinometra meridionalis*, A. Ag., sp., which occurs at this Station.

The fact that the hosts of all these forms of *Myzostoma*, which I have united under the same specific name, are so very closely allied, seems to confirm the justice of my view.

41. *Myzostoma caribbeanum*, n. sp. (Pl. X. fig. 4).

The single specimen that I possess has an oval thin body, equally rounded at the fore and hind ends; its colour is a dirty yellowish-brown, the length is 1·2 mm. and the breadth 1 mm. It is somewhat thicker and less transparent in the middle than towards the edge. There are forty-three obtuse cirri, measuring up to ·09 mm. in length; they cannot be divided into principal and secondary cirri, inasmuch as there are all possible intermediate conditions, from minute tubercles up to the longest cirri. At the hinder extremity is an unpaired median cirrus (*C.*). The parapodia (*p.*) are feeble, and occupy nearly the middle third of the radius. The round suckers (*s.*), which are small but very distinct, are in the middle line between the bases of the parapodia and the margin of the body. On the same level with these are the mouth opening (*m.*), the cloaca (*cl.*), and the obtusely ending genital papillæ (♂).

Host.—Uncertain. "Blake" Expedition, Caribbean Sea, 1877–78 or 1878–79 (label lost).

42. *Myzostoma rotundum*, n. sp. (Pl. X. fig. 2).

The animal is nearly circular, and of a yellowish colour at the margin, inclining to brown in the middle of the body; its length is ·832 mm., diameter ·88 mm., it is therefore one of the smallest species of the genus. The marginal border is prolonged into a number of short obtuse cirri, the longest of which measure ·08 mm., while the smallest are minute tubercles. The single specimen has altogether fifty-one cirri, arranged in quite an irregular fashion; the large and small cirri are at unequal distances and bear no relation to each other in their arrangement. The pharynx (*ph.*) is large and conspicuous, as also the stomach, cloaca (*cl.*), and the ten intestinal cæca (*i.*), especially on one side. The parapodia (*p.*) are relatively feeble, and occupy a circle at the inner end of the middle third of the radius; the large round suckers (*s.*) lie at the boundary of the middle and the last third of the radius, as also the mouth and cloacal aperture (*cl.*).

Host.—Probably *Actinometra meridionalis*, var. *carinata*, P. H. C., from Station 249 (Grenada) of the "Blake" Expedition.

43. *Myzostoma oblongum*, n. sp. (Pl. X. fig. 3).

Of this elegant species I have but one specimen, which unfortunately is not well-preserved; but I have been able nevertheless to make out the characteristic features of the species. The body is delicate and oblong, 1·7 mm. long and 1 mm. broad; the two ends are obtusely rounded. The marginal border is broad (one-sixth of diameter), distinctly separated, and quite transparent; it is provided with forty-four cirri (there were at any rate twenty-two upon one side, the other was not sufficiently well-preserved to make out their number); the cirri are ·045–·18 mm. in length, they are large, of equal diameter along their whole length, and terminate in an obtuse point. The suckers (*s.*) lie within the marginal border; they are rendered distinct by their darker colour and large size; they are hemispherical in shape and ·14 mm. in breadth. The parapodia (*p.*) are feebly developed, and the pharynx (*ph.*) is small and retracted inwards. The mouth (*m.*) is ventral and situated in the middle of the marginal border; the cloacal aperture was invisible, owing to the hinder part of the body being filled with ripe eggs (*ov.*).

Host.—Probably *Actinometra meridionalis*, var. *carinata*, P. H. C, from Station 249 (Grenada) of the "Blake" Expedition.

44. *Myzostoma abundans*, n. sp. (Pl. X. fig. 1).

This specimen is 3 mm. in length, and its greatest diameter 3·2 mm.; it was dredged at Martinique. On examination with a lens and by transmitted light, the three regions into which the body is divided are very distinct; the middle portion is yellowish-brown, and from its margin the relatively short parapodia (*p.*) arise. The strongly developed pharynx (*ph.*) is situated at the same level as the parapodia, the middle portion alone is somewhat thick—but thinner than in *Myzostoma cirriferum*—and 1·7 mm. broad; it is surrounded by a yellow zone, ·45 mm. in diameter, which is occupied by the terminal ramifications (*i.*) of the intestine. On the inside of this lie the large oval suckers (*s.*). The marginal border is pale yellow, ·3 mm. broad, and quite visible as a distinct region, even with the naked eye. There are nearly 100 short obtusely pointed cirri, which are more regular than those of *Myzostoma caribbeanum;* only a few are quite small, the majority being long and measuring ·046–·14 mm. Since none of the six specimens that I examined were absolutely intact, the number of cirri cannot be exactly stated; a great many in the smaller individuals were broken off. The marginal border also and the intestinal zone, being extremely thin and delicate, were much injured.

The mouth (*m.*) and cloacal aperture (*cl.*) are situated at the level of the external

margin of the suckers; the male genital openings (♂), but little prominent, lie still further inwards.

The largest specimen was dredged at St. Vincent (Station 224 of the "Blake" Expedition); it is 4 mm. in length, and considerably stouter and less transparent than the specimens described above. The intestinal zone is ribbed on the ventral side; the intestinal branches form externally elevated crests.

Host.—*Actinometra pulchella*, Pourt., sp., from Station 210 (Martinique) and Station 224 (St. Vincent) of the "Blake" Expedition. Another specimen came from Station 269 (St. Vincent) of the "Blake" Expedition, and probably from *Actinometra pulchella*, which occurred also at this Station.

45. *Myzostoma elegans*, Graff.

Myzostoma elegans, Graff, Genus Myzostoma, p. 12, pl. x. figs. 1–3.

I have only one specimen of this form, which was brought up by the "Bibb" Expedition, off French Reef, on *Actinometra meridionalis*. In diameter it was 2 mm.; the cirri were rather damaged.

Hosts.—(*a*) *Antedon triquetra*, Semper, MS., Bohol (Philippines).
(*b*) *Actinometra parvicirra*, Müll., sp., Bohol (Philippines).
(*c*) *Actinometra meridionalis*, A. Ag., sp. "Bibb" Expedition, April 3, 1869, off French Reef.

46. *Myzostoma antennatum*, n. sp. (Pl. VIII. fig. 1).

I received a single specimen from the Kiel Museum. The figure I have given is somewhat restored; the edges were so folded and pressed together that I found it necessary to divide the animal longitudinally, and then to draw each separate half; many of the long cirri which were injured by this process were completed by the help of their bases of attachment, and a comparison with the remaining intact cirri. The body is as stout as that of a well-developed *Myzostoma cirriferum*, and is darkish brown in colour; the median part of the body is opaque, but the marginal zone between the suckers (*s.*) and the border is thinner and slightly transparent, without being distinctly marked off from the rest. In life the body must have been circular; its length is 1·4 mm. The parapodia (*p.*) are well-developed, and stand in the middle line between the centre and the margin; the round conspicuous suckers are at about the end of the middle third of the radius. The mouth (*m.*) lies far inwards behind the foremost pair of parapodia; the strong pharynx, provided with papillæ, extends some way out of it. The cloaca (*cl*) is ventral in position, and lies in the more transparent marginal zone between the suckers and the edge of the body. The first, second, and last pairs of cirri are distinguished by their considerable length and size, as well as by their greater distance from each other. The first and last pairs are about 1 mm. long, the

second (anterior) pair are about ·6 mm. long, while all the rest are of equal size, and measure ·2 mm. The character of the cirri in this species recalls those of *Myzostoma brachiatum* (Genus Myzostoma, pl. ii. fig. 2).

Host.—Uncertain. Brought from Amoy by Dr. Gärtner, May 1877; Kiel Museum.

47. *Myzostoma cornutum*, Graff.

Myzostoma cornutum, Graff, Genus Myzostoma, p. 15, pl. x. figs. 4, 5.

Host.—*Antedon triquetra*, Semper, MS., Bohol (Philippines)

48. *Myzostoma brachiatum*, Graff.

Myzostoma brachiatum, Graff, Genus Myzostoma, p. 16, pl. ii. fig. 2.[1]

Host.—*Actinometra nigra*, Semper, MS., Bohol (Philippines).

49. *Myzostoma fissum*, n. sp. (Pl. IV. fig. 1).

The figure given of this species is enlarged seven times, and only pretends to approximate accuracy, since the only specimen at my disposal was so bent and rolled up that I was unable to extend it. Nothing can therefore be said about the ventral side. I shall merely describe, as well as possible, the dorsal side. In possessing large and deeply excised caudal appendages this species resembles *Myzostoma lobatum*, but differs in having six of them instead of four.

In both species there is a longitudinal furrow on the under surfaces of the caudal appendages. The colour is a dark brown. On the middle line of the back is a longitudinal crest, reaching from the obtusely terminating anterior end of the body as far as between the bases of the median longest caudal appendages. From the median crest five pairs of lateral elevations arise, which pursue an undulating course to the ten large prominent and pointed marginal serrations.

Host.—Uncertain (perhaps *Antedon inæqualis*, P. H. C.), from Station 174 (south-west of the Fiji Islands) of the Challenger Expedition.

50. *Myzostoma intermedium*, n. sp. (Pl. IV. fig. 2).

This unique specimen also was unfortunately so badly preserved that it was impossible to examine more than the contour. The body also was very much torn, and on account of its thickness but slightly transparent; only upon the margin, especially between the cirri, was it at all transparent. The colour is dark greyish-brown. The body is

[1] *Cf.* p. 8 of this Report.

circular in form, and about 2 mm. in diameter; the form of the cirri, which are, however, both relatively and absolutely larger, is like that of *Myzostoma quadrifilum*.

In the possession also of six caudal appendages it is intermediate between that form and *Myzostoma fissum*. The form of these appendages is like those of *Myzostoma quadrifilum;* they are divided into a larger basal part and a finer terminal thread (CA_1–CA_3). The last appendage (CA_3) that was not damaged measures from the margin of the body to the extremity 1·3 mm., the basal and terminal parts being of equal length. The second pair (CA_2) is somewhat shorter, and the exterior pair (CA_1) shorter still. The base of all the six appendages is continued for some way into the ventral surface of the disk. The slight development of the last pair of cirri (*c.*) is remarkable, compared to the rest,—they measure only ·45 mm.

Host.—Antedon multiradiata, P. H. C., from Station 187 (Torres Strait) of the Challenger Expedition.

51. *Myzostoma quadrifilum*, n. sp. (Pl. IV. figs. 3–6).

I had thirteen specimens, which I have united together under this specific name, and which came from the same host. The body is roundish, and terminates in four filiform caudal appendages, which differ from those of *Myzostoma quadricaudatum* in having a terminal thread. The light yellow marginal zone is distinctly marked off from the brown opaque middle portion. All the specimens, however, are not absolutely the same in regard to the length of the caudal threads and the form and length of the cirri; in some individuals the caudal appendages are entirely separated from their origin, in others they are united for a certain distance. There are, for example, two specimens measuring ·9 mm., in one of which the cirri are long, narrow, and slender, ·27 mm. long, and appear to be direct continuations of the margin, while in the other (figs. 5, 6) they are short, stout, and much wrinkled, measuring only ·1 mm. in length, and arise from the under side of the disk by a thick basal portion. I was prevented from making a strict distinction between the different varieties, from the fact that all the specimens, except those shown in figs. 3 and 4, were more or less injured or rolled up, and therefore unsuitable for an exact examination.

The smaller of the figured specimens (fig. 4) had a circular form, and measured ·7 mm., considering, as in *Myzostoma quadricaudatum*, the cloaca to be the termination of the body. The distinction between the disk and the caudal appendages is in this specimen very slightly marked, inasmuch as the basal parts of all the cirri are grown together, and the summits only are distinct. The intestinal cæca (*i.*) penetrate into the base of the caudal appendages—one into each. The mouth is subterminal; the cloacal opening (*cl.*) is placed on a slender papilla lying between the bases of the median caudal appendages. The pharynx (*ph.*) is moderately large, but I was unable to examine it in detail. The oval suckers (*s.*) are similar to those of *Myzostoma quadricaudatum*, and distant from the margin about

half their own diameter. The parapodia are well developed, the cirri about ·09 mm. long. The difference between this specimen and that shown in fig. 3 consists principally in the larger size of the latter; its body is about ·9 mm. long (measured to the point *X* where the median caudal appendage takes its origin; I could not find the cloaca); the length of the median caudal appendage is about 1·14 mm. As in the preceding species, the external caudal appendages are much smaller than the median ones. The median caudal appendages are grown together, while the exterior ones are free from their base upwards. The length of the last cirrus on either side (*c.*) is ·26 mm.; the rest are scarcely half as long. In all other dimensions this specimen (fig. 3) agrees with the first described specimen, the size of the pharynx, the parapodia, and suckers being of course actually larger since the specimen itself is larger.

Host.—Antedon bidentata, P. H. C., Station 186 (Torres Strait) of the Challenger Expedition.

52. *Myzostoma quadricaudatum*, n. sp. (Pl. V. figs. 5, 6).

The body is roundish and flat, light brownish in colour, and but slightly transparent; it has a length of 1 mm. and a breadth of ·9 mm., and bears twenty cirri, the first and longest pair of which measure ·23 mm., the rest averaging ·16 mm. The cirri are massive and end obtusely. The body terminates in four caudal appendages, every one of which contains an intestinal cæcum. They are of equal length (·4 mm.), and end obtusely. The parapodia (*p.*) are well developed, and contain strongly bent hooks (fig. 6); the round suckers (*s.*) are situated upon the margin. On a level with the suckers, between the fifth and sixth cirrus on either side, is the male genital aperture (♂), at the bottom of a shallow furrow. The mouth opening is behind the anterior margin, the cloacal aperture is at the base of the bifurcation of the median caudal appendages. The extremely small size of the pharynx (*ph.*) is remarkable.

Host.—Antedon fluctuans, P. H. C., from Station 190 (Arafura Sea) of the Challenger Expedition.

53. *Myzostoma lobatum*, Graff.

Myzostoma lobatum, Graff, Genus Myzostoma, p. 19, pl. ii. figs. 3, 4.

Host.—Actinometra fimbriata, Müll., Bohol (Philippines).

54. *Myzostoma bicaudatum*, n. sp. (Pl. V. figs. 2, 3).

This specimen, which is the smallest of the Myzostomida Caudata, measures ·45 mm. (without the caudal appendages); it is nearly circular in form, and flat on both sides. It is stout, hardly at all transparent, and brownish in colour; there is hardly any trace of a thinner lateral zone. The twenty cirri arise from the ventral side of the margin; in the only

specimen that I have they are nearly all cut off, but the stumps that have remained behind permit me to judge of their size. The longest cirrus (the first) measures ·16 mm., the shortest (fifth on the right side) measures ·03 mm.—commencing from the margin of the body.

The two caudal appendages are round and massive, becoming gradually smaller and arising from the ventral side; they end in an obtuse point. There is no terminal thread, and each contains an intestinal cæcum. They measure ·3 mm. from the margin of the body to their tip. The slender parapodia (*p.*) are prominent; the hooks are slight and not much bent at the tip (fig. 3). The small suckers (*s.*) are closely approximated to the margin of the body, and are flat and circular. The pharynx is remarkably thick and large, and measures nearly two-thirds of the length of the body; it extended some distance beyond the subterminally situated mouth. The cloacal aperture is, like the mouth, ventrally situated near the hinder margin and between the insertions of the two caudal appendages. Of sexual organs I could discover no trace, but there were a number of eggs round the intestinal cæca within the caudal appendages, which appeared to be unripe, and therefore mark out this specimen as a young one.

Host.—Actinometra meridionalis, A. Ag., sp., "Bibb" Expedition, January 16, 1869, west of Tortugas.

55. *Myzostoma filicauda*, n. sp. (Pl. V. fig. 4).

This species resembles more closely *Myzostoma bicaudatum* than the other species with two caudal appendages, viz., *Myzostoma filiferum*, firstly, by the strong development of these caudal appendages, and secondly, by the fact that the first and the last cirri are the longest. If it be really true that the terminal threads (see p. 8) appear with increasing age, it might well be supposed that this species is only an older stage of *Myzostoma bicaudatum*.

Moreover, among the seven specimens that I examined, all of which came from the same host, there was one about one-third smaller than the specimen figured, which differed from the rest in possessing no short terminal thread upon the caudal appendages. The specimens, however, were not well enough preserved to enable me to state this fact with entire confidence; possibly the terminal thread may have been torn off. In the meantime, therefore, I must consider *Myzostoma filicauda* as a distinct species.

The largest specimen (fig. 4) was 1·3 mm. long, and in breadth somewhat less. The only caudal appendage (the left hand one had been torn off) is 1·9 mm. long, and about one-seventh of this length is occupied by the terminal thread (*CF.*); it is cross furrowed here and there (*CA*). The tip of the terminal thread was wanting, and I have endeavoured, by comparison with other specimens, to compute its length. The greatest diameter of the caudal appendage is ·27 mm.; it contains a terminal branch (*i.*) of the

intestine, which extends as far as the terminal thread, and a number of eggs (*ov.*) closely pressed together. The two anterior cirri (*C.*) arise just in front of the mouth, and are ·4 mm. long; the second pair are ·12 mm., the last ·2 mm. The intervals between the cirri are fairly regular, but somewhat larger than the rest is the interval between the caudal appendage and the last cirrus. The body is dark brown coloured (yellower in some specimens), and much more massive than in *Myzostoma cirriferum;* at the same time it is brittle. Towards the outer margin it is more transparent; the elliptical suckers (*s.*), remarkable by their large size (·18 mm. greatest diameter), are closely approximated to the margin of the body. The parapodia (*p.*) are strongly developed, and often extend considerably beyond the margin of the body when the hooks are protruded. Above the third parapodium is visible on either side an oval vesicula seminalis, opening by the somewhat inconspicuous male genital aperture (♂).

The mouth is quite close to the anterior end of the body; it is ventral in position, and followed by a large pharynx apparently provided with papillæ (*ph.*). The cloacal aperture (*cl.*) opens on a conical papilla arising between the caudal appendages.

Host.—Antedon hageni, Pourt., "Corvin" Expedition, May 17, 1867; off Sandkey.

56. *Myzostoma filiferum*, n. sp. (Pl. V. fig. 1).

The body of this species is opaque and dark brown in colour, becoming gradually lighter and more transparent upon the margin; there are twenty short, obtuse cirri, which arise from a larger basal portion. The form of the body is nearly circular, and ·75 mm. in diameter; it terminates behind in two long caudal appendages, measuring more than 1·5 mm.; each of these is divided into a basal portion ·24 mm. long, which contains an intestinal cæcum and a fine terminal thread measuring 1·35 mm. The length of this terminal thread and the dimensions of the cirri mark out this species as distinct from *Myzostoma bicaudatum*, which it otherwise very closely resembles. The first and the last pair of cirri in the latter are relatively and absolutely larger than the corresponding cirri in *Myzostoma filiferum*, though the animal itself is smaller; in *Myzostoma filiferum*, in fact, these very cirri are the smallest ones of all.

Host.—Antedon bidentata, P. H. C., Station 186 (Torres Strait) of the Challenger Expedition.

57. *Myzostoma carinatum*, n. sp. (Pl. II. fig. 9, *A*, *B*).

I was able to examine only two not very well-preserved specimens—one from Martinique, the other from Mauritius. The following description relates to the latter, which is shown in the figure (fig. 9). The colour of the animal is lightish yellow, its length 1·8 mm.; it is somewhat cup-shaped on the ventral side. The thickness of the body is even, and is about the same as in a large specimen of *Myzostoma*

cirriferum; the consistency of the body is rather loose; there is no trace of any marginal border; there are more than twenty cirri about ·2 mm. long. On the dorsal surface is a longitudinal elevation crossed by furrows; from this seven pairs of wavy lateral elevations are given off, which radiate outwards to the periphery. The most anterior pair of these is the smallest, and is parallel with the middle one; the others increase in breadth and height towards the margin of the body, where they terminate abruptly.

The parapodia are slight; there was no trace of any suckers. The mouth is subterminal, as also apparently the cloaca, if I am right in what I take to be the cloaca. The Martinique specimen is about half as large; the circular contour of the body is more apparent, as it is not bent inwards; the dorsal elevations are less distinct; this specimen was worse preserved than the first.

Hosts.—(*a*) *Actinometra pulchella*, Pourt., sp., Station 193 (Martinique) of the "Blake" Expedition.

(*b*) *Antedon impinnata*, P. H. C., Mauritius, N. Bay, 15 fathoms; Kiel Museum.

58. *Myzostoma coronatum*, n. sp. (Pl. III. fig. 9, *A*, *B*, *C*).

This species is well marked by its characteristic shape and bright ochre-yellow colour. The largest of the four specimens examined is 3·2 mm. long and 2·2 mm. broad. The hinder portion is more obtuse than the fore part; the contour of the animal is oval. The back is much vaulted, but less so in the anterior part of the body, especially from the level of the second pair of cirri, so that it appears to be transversely furrowed when viewed from above and behind. Towards the margin the body becomes thinner and flatter, and ends in ten pairs of broad cirri, the length of which is about ·5 mm.; they are divided into a basal and distal portion of equal length. The dorsal surface is divided by longitudinal and transverse furrows into a number of quadrilateral elevations. In two specimens as large as that figured, the sides were bent down towards the ventral side; the dorsal elevations were not flat but tubercular, and further removed from each other. The smallest specimen is nearly circular (1·2 mm. long, 1 mm. broad), and is sculptured on the back like the individual first described, but the furrows are rather shallower, and hence the elevations less distinct.

The ventral surface (*A* and *B*) has a large longitudinal ridge instead of the typical central elevation; it commences at the subterminal mouth, and extends as far as the cloacal papilla, which projects a little beyond the margin of the body and may be seen from above. The large pharynx (*ph.*) was visible extending out of the mouth, and has behind its free margin a circle of papillæ. Since these are visible from above they appear like a serrated circlet on the anterior portion. The ventral side is covered by delicate transverse furrows. The parapodia (*p.*) are placed very far outwards, and are

feebly developed in proportion to the robust body. Outside the third pair of parapodia are the male generative apertures (♂), which project as small tubes. I could not find any trace of suckers.

Host.—Bathycrinus aldrichianus, Wyv. Thoms., n. gen. and sp., from Station 146 (west of the Crozets) of the Challenger Expedition.

59. *Myzostoma folium*, n. sp. (Pl. III. figs. 10, *A*, *B*, *C*, 11).

This elegant species is leaf-like in its general form, the anterior part of the body has a considerable diameter, which is gradually reduced until it terminates in a blunt point. The body is tolerably flat, but there is a slight dorsal longitudinal elevation. The dorsal surface is finely wrinkled and brown in colour; the marginal zone is transparent, yellowish in colour, and serrated.

On the ventral side the central part is even more sharply marked off from the marginal zone (*A* and *B*). The marginal zone is rather different from the same structure in other Myzostomida; it appears very much as if it were composed of a number of cirri fused together. The length of the single specimen is 5 mm., its greatest breadth nearly 2 mm. In the middle line of the ventral surface is a long narrow elevation running from the mouth to the cloacal aperture (*cl.*), which is distant one-sixth of the length of the body from its extremity. The pharynx (*ph.*) is very large, and extends some distance out of the mouth, measuring about one-fifth of the whole length of the body. The parapodia (*p.*) are strong and well developed; they are arranged in two parallel lines in the anterior part of the body. The last pair, however, are closer together, and arise quite near the median elevation. Each parapodium is divided by a circular furrow into a larger basal portion and a longer, but thinner, terminal part. On the latter there is a deep ventral furrow. In fig. 11 is shown the termination of one of the hooks. The point is somewhat bent and very strong; it shows upon its concave side a flat furrow; there was no trace of any suckers.

Host.—Antedon manca, P. H. C., Station 192 (south-west of Papua) of the Challenger Expedition.

60. *Myzostoma asymmetricum*, n. sp. (Pl. XI. figs. 4–8).

Mr. Herbert Carpenter observed a portion of an arm of *Pentacrinus alternicirrus*, two of the pinnules of which were larger than the rest; this portion is drawn from the side on fig. 4 *B*, which shows that these pinnules are twice as large as any of the others. The arms themselves are also slightly swollen in the neighbourhood of these pinnules (*), as may best be seen from the dorsal surface (*A*). On examining it, a yellowish coloured *Myzostoma* was found on the inner side of the enlarged pinnule (fig. 5). The parasite was not attached to the ambulacral side of the pinnule, though close to it, and the pinnule

therefore appeared to be asymmetrical (fig. 6 *B*,—6 *A*, section of the pinnule). Unfortunately the two specimens of this *Myzostoma* were not well preserved, and the margin especially showed traces of injury. The dorsal surface is slightly vaulted, as also the middle of the ventral surface (ideal section, fig. 8); the animal, although nowhere transparent, grows thinner by degrees towards the margin. The contour is oval, the length being 2·3 mm., and the breadth 1·4 mm. It is a noteworthy fact that one side of the body is longer than the other, and describes a greater arc (fig. 7), making the animal in this way asymmetrical. This asymmetry is connected with the position of the animal inside the pinnule; the side turned towards the marginal border of the pinnule, having more room to grow, is larger than that turned towards the ambulacral groove. We may also conclude that the parasite had remained within the pinnule from the very first.

The mouth and cloaca are terminal, and the pharynx is of considerable size. The parapodia are not much developed, and appear like small warts (*p.*), not more than ·16 mm. long; they are arranged in two longitudinal rows, and all the ten are at equal distances from each other.

Host.—Pentacrinus alternicirrus, P. H. C., Station 214 (south-east of the Philippine Isles) of the Challenger Expedition.

61. *Myzostoma pentacrini*, n. sp. (Pl. XI. figs. 9-15).

Of this species v. Willemoes Suhm[1] remarks, "Während Thomson die Thiere (verschiedene Arten grosser *Pentacrini* aus 500 Faden in der Nähe der Meangis-Inseln) selbst vornahm, untersuchte ich sie auf Parasiten und fand zwar keine freilebenden, aber desto mehr *encystirte* Myzostomen. Und zwar waren es diesmal nicht, wie ich früher einmal bei *Comatula* gefunden habe, ein grosses und ein kleines Individuum, die in einer Cyste zusammensassen, sondern 2–3 *gleich grosse offenbar geschlechtsreife Individuen.* Einige von den Pentacrinen sind ganz mit ihnen bedeckt und ihre Arme, deren Kalksubstanz da, wo die Cyste sitzt, resorbirt ist, in Folge dessen ganz brüchig. Freilebende Exemplare fanden sich niemals bei diesen mit Cysten behafteten Crinoiden, weder früher bei *Comatula* noch jetzt bei *Pentacrinus*, so dass es mir wahrscheinlich scheint, dass die Myzostomen sich alle zu einer bestimmten Zeit zu zweien und dreien an den Armen ihrer Wirthe einkapseln und begatten. Die Höhle, in der sie sitzen, steht wie gesagt durch ein Loch mit der Aussenwelt in Verbindung, und durch dieses werden wohl die Eier nach aussen entleert. Ob dann die jungen sich gleich wieder einbohren, was das wahrscheinlichste ist, oder ob sie eine Zeit lang frei am Kelch und den Armen des *Pentacrinus* leben, lässt sich noch nicht sagen."

These words no doubt refer to the species that I have just named. I examined two stained preparations of the animal which had been made by v. Willemoes Suhm; there were also two specimens, together with an individual of *Myzostoma deformator*, received from

[1] Brief VI. Von der Challenger Expedition, *Zeitschr. f. wiss. Zool.*, Bd. xxiv., 1876, p. lxxix.

Sir Wyville Thomson, and a number of portions of arms of *Pentacrinus*. This species does not produce real cysts upon the arms of its host, but only swellings of several (3–6) joints, which gradually disappear. In fig. 9 there is displayed a swollen arm viewed from the dorsal surface and from the right and left sides. The swollen segments of the arms are not placed so close together as in the normal healthy arm, and are irregular in shape, being sometimes partially replaced by intercalated plates; the basal pieces of the pinnules that arise from these joints are considerably enlarged. The cavity where the *Myzostoma* lives lies between two neighbouring joints; it opens on to the exterior by a slit which is bordered in an irregular fashion. If more than one *Myzostoma* be associated together in the same malformation, then the cavity of this is divided up into secondary cavities, one for each parasite. Thus in fig. 9 the swollen portion of the arm shows two cavities, separated from each other by a thick calcareous wall, and each opening by a separate aperture and ending in a tube-like prolongation on the ambulacral furrow. Fig. 10 represents the arm (fig. 9*C*) cut in the direction of the arrow and viewed from the distal end. In each cavity is a *Myzostoma*, with the anterior end turned towards the tube-like prolongation on the ambulacral furrow, and the pharynx extends out of the aperture. The swelling in one of the specimens in my possession occupied only two joints, a third joint being only slightly malformed; there was but one aperture on the dorsal side (fig. 15), and the cavity contained but a single specimen. The expression "absorption of the calcareous matter" used by v. Willemoes Suhm is not, in my opinion, happily chosen. There is in fact no absorption, but only a transference of the calcareous matter; it disappears inside in consequence of the growing *Myzostoma*, but is deposited again peripherally, and increases the thickness of the arm. Nor are the arms so brittle at the place occupied by the parasite as his description would seem to indicate; they appeared to me to possess as great a resistance as any of the other parts; the malformations, however, must interfere seriously with the mobility of the arm.

This *Myzostoma* (figs. 12, 13) is of a uniform brown colour, and like all the encysted forms has its lateral portions turned upwards, so that sometimes the marginal borders lie one upon the other (fig. 12); sometimes the dorsal surface appears to be reduced to a longitudinal furrow, so great is the folding of the sides of the body (cross section, fig. 14). Inside the cavity, the animal is placed with its ventral side turned towards the axis of the arm of the *Pentacrinus*, the dorsal fissure towards the periphery of the cavity, occasionally directly (fig. 9*B*) towards its opening.

The animal is rolled up in such a regular fashion that it becomes tube-like; from one end (fig. 13) projects the pharynx (*ph.*), and from the other the cloacal papilla (*cl.*), both being terminal in position. The parapodia (*p.*) are placed on each side in a semicircle, between the centre and the margin of the body; they are small, conical warts of ·2 mm. in length, and lie in shallow cavities.

Suckers are entirely absent. The form of the body when unrolled is circular, and

the margin is covered with short cirri, but the specimens were not sufficiently well preserved to enable me to fix the number; on the two specimens mounted and preserved by v. Willemoes Suhm (one is displayed in fig. 11) only a few cirri (*c.*) were to be observed. In these specimens, however, the abundant ramification of the intestinal cæca was very distinct; it is more abundant in this species than in any other. Cross sections show from twenty to thirty cæca on each side, irregularly branched. This rich ramification of the intestinal cæca, together with the form of the body and the existence of cirri, are the principal structural features that distinguish this species from the closely-allied *Myzostoma deformator*, with which it agrees in many other points, including the structure of the generative organs. It is, like the above-mentioned species, hermaphrodite, but differs from the typical free-living forms, in that the male generative opening and testis are only developed upon one side of the body; the testicular follicles are concentrated into a compact mass on one side, on the other there are only small rudiments of them, and the space generally occupied by these organs is filled with the highly-developed ovarian follicles.

The individual shown in figs. 12 and 13 was 3 mm. long, the breadth of the animal rolled up was 1·7 mm.

Host.—Pentacrinus alternicirrus, P. H. C., from Station 214 (south-east of the Philippine Isles) of the Challenger Expedition. There were fourteen specimens of *Pentacrinus* dredged at this Station, some of which were inhabited by several, some by many, specimens of *Myzostoma pentacrini*, and had the arms enlarged.

62. *Myzostoma deformator*, n. sp. (Pl. XII. figs. 1–9).

This species is parasitic in the pinnules, into which it bores its way in couples, causing them to become swollen and ovoid. This species is rarer than *Myzostoma pentacrini*. I examined four pinnules, three of which had the form shown in figs. 2 and 3, and no corresponding swelling of the arm-joint; in another one (figs. 4–6) the arm-joints (*a.–c.*) were swollen too.

The cysts have the same colour as the arm; their walls are calcareous, of considerable thickness and hardness, and may be recognised as malformed pinnules by their mode of attachment to the arm, especially when (figs. 2, 3) the ambulacral groove is continued along the whole length of the pinnule. The last-mentioned cyst measured 9 mm. in length, by 4·5 mm. in breadth in the middle, and ended in an obtuse point about 1 mm. in length, into which the concavity of the cyst did not enter. The arm itself was not much altered, either in form or consistence, the only alteration was a slight swelling of the joint bearing the malformed pinnule (fig. 3), and a shortening of the pinnule of the other side (fig. 2 *); but it cannot be said with any certainty that this last-mentioned alteration has anything to do with the parasite in the opposite pinnule. As is always the case in this species, the

cyst was lined by a tough brownish membrane, which in the middle of the cyst (in the direction of the arrow, fig. 2) on the antambulacral side is raised into a fold half as high as the cavity. Two equal-sized cavities communicating by a fissure are thus formed, in each of which was a *Myzostoma*, which did not, however, occupy the whole of the cavity; each lay on the ventral side of the cyst, at opposite extremities of the cyst, one near the point the other near the arm-joint; the proximal chamber (fig. 3) communicates with the exterior by a fine foramen. The second cyst had the same form and size, the third was similar but smaller by one-third, and was formed of numerous polygonal calcareous plates, the ambulacral furrow being bordered by several rows of them. The two parasites occupying this smaller cyst were, although small, evidently adult, for they were filled with eggs. This small cyst also enabled me to come to some conclusion respecting the growth and formation of the cysts. In all probability its growth commences by an enlargement of the joints of the pinnule; additional plates are subsequently intercalated, which, finally, when the parasite is fully developed, fuse together and form a solid wall, showing only traces here and there of its original composition (figs. 2, 3, 4, 6). The cyst displayed in figs. 4–6 (its point is broken off) differs from the others by its more rounded form, and by the two neighbouring arm-joints, as well as the one that bears the pinnule, becoming swollen. The hindermost of these (*c.*) has an enlarged pinnule—here broken off—whereas the anterior has lost its pinnule. The septum dividing the cavity of the cyst is longitudinal, it is attached to the wall only near the external orifice, and there is a fissure therefore left putting the two cavities into communication, but too small to allow the parasite to change its place. As in fig. 3 so also here (see the arrow, fig. 5), the aperture communicating with the exterior belongs to one of the two cavities only.

This species is found always in pairs in a single cyst, the individuals being of the same size and of a dark brownish colour and peculiar form (fig. 1). The lateral parts, as in *Myzostoma pentacrini*, are turned upwards at a sharp angle, so that in section the body is wedge-shaped (figs. 7, 8); the flat back of the wedge is formed by the ventral surface of the animal, and is bordered by the parapodia (fig. 1 *B*); the parts lying outside the parapodia are bent towards each other and form the sides of the wedge. The marginal borders being unprovided with cirri are apt occasionally to come into such close contact above that only a very narrow fissure is left, through which the dorsal surface of the animal can be discerned; sometimes the marginal borders are again bent outwards (fig. 1 *A*) in a lip-like fashion, so that a kind of tray is formed, the outer part of which corresponds to the ventral, the inner to the dorsal side of the animal.

Suckers are entirely absent, and the five pairs of parapodia are but slightly prominent as flat circular disks. The hook-apparatus is very feeble in proportion to the size of the animal, and the hook is only about half as long as the thickness of the body (fig. 7, *u*). The length of the specimen shown in fig. 1 (taken from the cyst, fig. 2), is 3 mm., the breadth of the flat ventral side, 2·4 mm. Considering that the bent portions of the

lateral margins are more than 1 mm. long, a total breadth of 4·5 mm. will be rather too little than too much, and in any case greater than the length, which, since the animal is turned up at both ends, will be at the most 4 mm. The body is thickest in that region that bears the parapodia (figs. 7, 8), the middle of the body being somewhat thinner and measuring ·5 mm. in cross section in an individual somewhat smaller than that represented in fig. 1. The alimentary canal is provided with a terminal mouth and cloaca, the stomach is very straight (*st.*), with rather slightly developed intestinal cæca (*i.*), nearly as in *Myzostoma glabrum*, but more richly branched terminally.

The dorso-ventral muscles (*dvm.*) are extraordinarily developed, but the hook muscles are very feeble, and since the musculi centrales (*mc.*) are but slightly developed, a ventral muscular mass is entirely absent. Testicular follicles (fig. 8, *t.*) are to be found only upon one side, where they exist in great numbers, but pressed into a compact mass. The corresponding region of the opposite side is occupied by ovarian follicles, which in this species do not occupy the whole body but only the central portion, so that a cross section, in the region of the first and last pair of parapodia for instance, shows but few ova (fig. 7, *ov.*), while in the middle of the body all the space unoccupied by the other organs is taken up by the ovaries (fig. 8, *ov.*). The highly vacuolated character of the ova (fig. 9, *b*) is remarkable. This is, I believe, caused by the alcohol having dissolved many of the yolk globules, thus leaving cavities in the protoplasm of the egg. These cavities increase in size and number as the eggs become more and more mature. In small unripe eggs (*a.*) they are but small and inconspicuous, and in the very youngest ova (fig. 7, *ov.*) absolutely no trace of any vacuolation is to be observed. Both the individuals inhabiting a single cyst are equally formed in reference to sex, and, as already mentioned, ova are to be found in both specimens accumulated on the back. Also there are numerous eggs to be found loose in the cyst, which find their way through the aperture to the exterior, either as eggs or as ciliated embryos, the females themselves probably never leaving the cyst.

Host.—Pentacrinus alternicirrus, P. H. C., from Station 214 (south-east of the Philippine Isles) of the Challenger Expedition. Five out of the fourteen gathered at this Station had cysts.

63. *Myzostoma cysticolum*, n. sp. (Pl. XIII. figs. 1–5).

Mr. Carpenter sent me four specimens of a variety of *Actinometra meridionalis*, A. Ag., sp., dredged during the "Hassler" Expedition, the arms of all of which showed peculiar swellings. There was only one cyst to be found on each arm (two specimens had two, one three, and one five cysts), situated from the base to the middle of its length. The cysts were all of the same colour as the skin of the ambulacral furrow, but rough and hard from the deposition of calcareous matter in their walls. Each cyst opened by a small orifice at one end, which, however, is irregularly situated with respect

to the disk, being sometimes turned towards it and sometimes away from it. The shape of the cysts, and their proportion to the parts of the arm is also quite different. Sometimes they are extended and sausage-shaped (fig. 2), sometimes more ovoid (fig. 1), sometimes (fig. 3) intermediate between these two forms; the cysts are never longer than 3 mm., or broader than 2 mm. Some lie longitudinally in the ambulacral furrow of the arm (fig. 2); some extend along the pinnule (fig. 3); some are independent, and only attached by one extremity (fig. 1), where the cyst is laid transversely over the arm and bent to the antambulacral side. One cyst arises from the ambulacral furrow, and becomes attached to two opposite pinnules growing along their bases. The great thickness of the wall of the cysts is shown in the section (fig. 4). Every cyst contains a large brown coloured female (♀) and a small yellowish dwarf male (♂). The latter is transparent, and lies with its ventral side close to the side of the cyst, and with the dorsal side turned towards the female. The female has its lateral parts bent up and touching on the dorsal side, so that a tube is formed, the exterior wall of which is formed by the ventral surface, while the dorsal side forms a canal which is trilateral in section, and contains numerous eggs (fig. 4, *x*). As in *Myzostoma inflator* and *Myzostoma murrayi*, so in both sexes in the present species the suckers are absent; the female has no parapodia, but in their place are traces of the hook-apparatus. In neither sex are there cirri; the mouth (*m.*) and cloaca (*cl.*) are terminal.

The most striking difference between this species and the other dicœcious species is, that the female possesses rudiments of testicles besides the ovaries, which together occupy all the available space between the alimentary canal and the body-walls. The rudiments of the testis are in the form of collections of small cells (*t.*), closely resembling the immature testicular follicles of hermaphrodite forms, situated beneath the intestine; the existence of these rudiments is interesting, inasmuch as this species forms therefore a link between the hermaphrodite and dicœcious Myzostomida.

The intestinal ramifications of the female (*i.*) reach almost to the margin of the body, and between them pass bundles of muscular fibres running from the dorsal to the ventral surface. The female is very firmly attached to the walls of the cyst, so that it was found impossible to detach one without injury. It appears to be circular in form, with a diameter of 2 mm. at the outside, and considerable thickness. The female shown in fig. 4 was ·6 mm. thick in the middle of the body, and ·2 mm. at the commencement of the lateral portions of the body.

The male (fig. 5) is smaller than usual. It is circular in form, with a diameter of ·8 mm. The compact testicles (*t.*), with the marginally situated genital apertures (♂), placed somewhat behind the middle of the body, and the intestinal canal (i_1–i_3, the cæca; *r*, the small rectum), are distinctly visible, and though I was unable to follow the intestinal cæca to their extremities, it appears that they differ from those of the female in not reaching the margin, but leave a large marginal zone unoccupied. The parapodia (*p.*) are small,

obtusely-pointed elevations, remarkable for the size of their hooks (·17 mm.) and manubria (·1 mm.), as well as for the powerful development of the hook muscles.

This same species was also taken during the "Blake" Expedition at Station 249 (Grenada). The cyst was quite similar in form and position to that shown in fig. 1, but smaller in size (only 1 mm. long and ·7 mm. broad), and of a more solid consistency. The parasites, though isolated and in a fragmentary condition, were evidently *Myzostoma cysticolum*.

Host.—*Actinometra meridionalis*, var. *carinata*, P. H. C., dredged by the "Hassler," January 22, 1872, off Cape Frio, and by the "Blake," at Station 249 (Grenada).

64. *Myzostoma tenuispinum*, n. sp. (Pl. XIII. figs. 6–16).

This species forms swellings on the arm-joints on the dorsal side, of ovoid or irregular shape; the ambulacral furrow and the pinnules are therefore left intact. There are cysts occupying only one arm-joint (fig. 13), whereas all the larger cysts occupy two joints; sometimes in this latter case the boundary line between the two swollen joints remains distinct, sometimes less visible on account of intercalated plates (figs. 12, 14, 16). This is especially the case with the extraordinarily large cysts formed at the axillary plates, just before the bifurcation of an arm, where a great number of intercalated plates form the wall of the cyst (fig. 15). The smaller cysts always have only one round or fissure-like aperture, whereas the larger cysts have two or three apertures, one of which is always larger, and may be called the main aperture (fig. 15, x), while the others are irregular, and seem, when present, to be owing to the spaces left between two adjacent plates (fig. 15, y, z). Each cyst contains a large female and a small dwarf male, the latter always near the main aperture, towards which also the pharynx of the female is turned. The interior of the cysts is always covered by a brownish membrane, which cannot easily be removed. The plates of the cyst are hard and calcareous; they are of considerable thickness, and adhere very closely to each other. Since the size of the cyst corresponds to the size of the individual within it, one may conclude that the large cysts are gradually formed from the small ones (fig. 13), by the growth of the parasite, the cavity becoming continued on to neighbouring arm-joints. The arm cysts of *Myzostoma tenuispinum* are sometimes found combined with the pinnule malformations produced by *Myzostoma willemoesii*, and cause a very peculiar and remarkable appearance. These will be more exactly described when I come to treat of *Myzostoma willemoesii*.

There were several cysts upon each of the hosts, partly near the distal, partly near the proximal end of the arm, but mostly in the middle portion. A specimen of *Antedon inæqualis*, P. H. C. (Station 170, Kermadec Islands, Challenger Expedition), had also a pinnule that contained *Myzostoma willemoesii*, and two small and two large cysts, one of which is shown on fig. 6, magnified seven times and viewed from both sides. At C there is this cyst opened containing a female (♀, seen from behind) and male (♂). The first

has a straight, tray-like back, vaulted towards the sides and from before backward, bearing the mouth at the end turned towards the ventral side (fig. 8, female seen from ventral side), whereas the obtuse cloacal papilla is to be seen at the hinder extremity exactly terminal. The ventral side forms an obtuse longitudinal keel, vaulted down to the marginal borders, and bearing on each side, arranged in a semicircle, a series of small, wart-like parapodia, measuring at the most ·1 mm. in length. The great thickness of the body is seen by the ideal cross section (fig. 9), and longitudinal section (fig. 10); both are in the natural position, with the dorsal side uppermost. The marginal borders are like those in the male (fig. 7), but not quite so conspicuous; they are curved like them, and provided with seven cirri on each side. The length of the female taken out of the cyst (fig. 6) was 2·5 mm., the breadth 2 mm. The male (fig. 7) belonging to it is quite flat and transparent; the transverse and longitudinal diameters of the disk are equal, measuring 1·2 mm. The mouth and anal aperture are terminal, the pharynx is half as long as the body; the middle intestine or stomach gives off on each side three main intestinal branches, the middle one of which is again divided into three smaller ones. The intestinal ramifications do not reach the margin of the body, but leave a considerable area unoccupied. The testes (*t.*) are round, compact glands; the male genital apertures (♂) are marginal, and situated just in front of the fourth cirrus. The unequal distances at which the cirri are placed from each other are more striking in the male than in the female; this fact, and the characteristic contour of the body, mark out the species. The parapodia (*p.*) are blunt and conical in form; their hooks are extremely delicate and nearly straight; they measure at most ·14 mm. Suckers are absent in both sexes.

Another individual of *Antedon inæqualis*, from the same locality, had two small cysts, one of which is represented in fig. 13, and the three arm-swellings represented in figs. 11, 12, 14. All the figures are magnified two and a half times, and figs. 11, 14 very closely resemble the cyst (fig. 6), from which indeed fig. 14 only differs by the remarkable cross arrangement on the arm (*A* from the side, *B* from the back). But fig. 12 is remarkable in that the cyst is not ovoid and vaulted, but flat on the upper side. The female taken out of the cyst (fig. 13) was 1·8 mm. long, the male ·8 mm.

From the same locality I have some more fragments of the arms of the same species, bearing cysts formed in the same manner.

Myzostoma tenuispinum is also found upon *Antedon angusticalyx*, P. H. C. (Station 214, south-east of the Philippine Isles, Challenger Expedition), of which species I had (1) a specimen with three large cysts of the same form, and arranged similarly to the cyst shown in fig. 6, all having but one aperture; (2) two arm-fragments, each bearing a cyst of similar appearance, but smaller; (3) two arms with cysts at the axillar-joints. The size and form of one of the latter may be seen by referring to fig. 15 *A–C*, where it is represented as magnified seven times; the other is quite similar in form, but somewhat smaller; both stand off from the arm, and the free end bearing the main aperture (*x.*) is

turned inward to the disk. Fig. 15 has, besides the main aperture, two other apertures, small orifice (*z*), and a remarkable triradiate fissure (*y*); the smaller cyst shows only one secondary aperture on the place where in fig. 15 *C* the fissure *y* is visible. The cyst (fig. 15), in spite of its large size, contained only a single pair of the parasites, but both were of a larger size than usual, the female 4 mm., the male 2 mm. in length; both were of a deep brown colour.

A single specimen, which had been mounted on a slide by Dr. v. Willemoes Suhm, and which was sent me by Mr. Murray, contained a male. It was labelled—"*Myzostoma*. The little individual of the parasite pair in the cavity of the *Comatula* arm." There were no remarks as to locality, but undoubtedly a passage from the third letter of v. Willemoes Suhm[1] refers to this species, since he, as is evident from his preparations, has not separated *Myzostoma tenuispinum* from the following species *Myzostoma willemoesii*.

Hosts.—All the cysts collected during the Challenger Expedition were found upon the following hosts:—

(*a*) *Antedon inæqualis*, P. H. C. (No. 62), Station 170 (Kermadec Islands). Two out of twelve specimens had cysts. One had four (two small and two larger), the other five (two small and three large ones), all in the first third of the arm. Station 174 (south-west of the Fiji Islands).—One out of five individuals had cysts (among them the compound cyst referred to of *Myzostoma tenuispinum* and *Myzostoma willemoesii*).

(*b*) *Antedon angusticalyx*, P. H. C., from Station 214 (south-east of the Philippine Isles). One specimen had three large cysts; there were also two arms, each from a different individual, and both furnished with a large cyst on its basal part (fig. 15); and two fragments each with one cyst.

(*c*) *Antedon basicurva*, P. H. C. (No. 61), from Station 170 (Kermadec Islands). One specimen (out of fourteen) had a single cyst (formed as fig. 6) in the proximal third of the arm. As I could not extend the arms of the Crinoid, which were strongly folded together, it is very possible that other cysts, though present, had escaped my attention.

(*d*) *Antedon incisa*, P. H. C. (No. 61A), from Station 170 (Kermadec Islands). There was a single cyst on one out of five individuals on the proximal third of the arm. Fig. 16 shows it twice the natural size (copied from P. H. Carpenter's plates). Station 174 (south-west of the Fiji Islands).—Two specimens of the Crinoid were dredged, but neither had cysts.

[1] Von der Challenger Expedition, Brief III., *Zeitschr. f. wiss. Zool.*, Bd. xxv., 1875, p. xxxi.: "Den kleinen Parasiten der Comatula, Myzostomum, fanden wir zuerst in Halifax und seitdem habe ich ihn oft bemerkt. Diesmal (*i.e.*, between Kermandek and Fidji Islands) aber unter eigenthümlichen Umständen unter denen er wohl noch nicht zur Beobachtung gekommen ist. Ich fand nämlich an den Armen einer Comatula aus 600 Faden Anschwellungen von der Grösse eines Schrotkornes No. 3. Eine kleine Öffnung führte ins Innere, das von einer zarten Haut ausgekleidet war, und hier fanden sich stets 2 Myzostomen, ein grosses Individuum, das viel dicker ist als irgend welche, die ich früher frei auf den Armen des Seesterns fand, und ein kleineres, das etwa nur ein Fünftel des vorigen misst."

65. *Myzostoma willemoesii*, n. sp. (Pl. XIV. figs. 1–8).

One of the Canada balsam preparations, which were made during the voyage by v. Willemoes Suhm, and sent me by Mr. Murray at the end of 1882, contained a large and a small *Myzostoma*, and was labelled "*Myzostoma*, one pair from *Comatula*-arm-cave, Kermadec." The specimens were deeply stained with carmine, and no doubt much squeezed, as could be seen by the numerous folds. Although not much more than the contour of the animal could be observed (figs. 1, 2), it was evident that it was a new species. I received from Mr. P. H. Carpenter some additional material, which enabled me to study the form of the cyst. This species inhabits *Antedon basicurva* and *Antedon inæqualis*, P. H. C., and causes the pinnules to become spirally twisted; the margins of the spirals are in close apposition, forming a space in which the parasite lives, communicating with the exterior by an aperture at the point and by a fissure at the base. Fig. 6 represents one of these malformed pinnules in *Antedon inæqualis*, P. H. C., magnified five times, and fig. 7 shows the first three joints of this pinnule viewed from the inside (*A*) and from the outside (*B*). The ambulacral furrow is continued through the basal fissure into the interior of the cyst as far as its point. The single joints of the pinnule have, as may well be seen in fig. 7, a regular roof-shape, and each side, the one turned towards the arm, as well as the one turned away, is smooth and equal. In two cysts, however, of *Antedon basicurva*, P. H. C., and in one more than the other, the sides of the pinnule-joints that are turned towards the arm are longer than the others and irregularly notched (fig. 8, C). Each cyst contains a female and a male, the female being always the larger, and placed quite close to and with its ventral side attached towards the inner wall of the cyst. This species differs in many respects from the other dicœcious cysticolous forms (*Myzostoma cysticolum*, *Myzostoma tenuispinum*, *Myzostoma inflator*, *Myzostoma murrayi*), and recalls the typical free-living forms, in that both male and female are furnished with powerful suckers and ten pairs of long cirri.

The female taken out of the cyst (fig. 6) is displayed in fig. 3, viewed from above, and in fig. 4 viewed from below. All the other cysticolous forms are turned upwards on both sides; but in this species it is the anterior and posterior ends of the body that are turned up, the mouth and cloaca therefore being also turned upwards. The diameter of the disk of the body, which is circular when extended, is 2·8 mm., the thickness in the middle is about the same as in a full-grown specimen of *Myzostoma glabrum*, but becomes less towards the marginal portion, which is therefore somewhat transparent. The ten pairs of cirri are not greater than ·15 mm. in length; the anterior parapodia, situated close to the mouth, are the smallest (fig. 3**); the parapodia are arranged in two longitudinal rows nearer to the middle line than to the border, and are at quite equal distances from each other (fig. 4, *p*). They are small and obtusely pointed, ·12 mm. long at the most,

The suckers (*s.*) are visible with the lens as small elevations, sharply marked off from the body, and are nearer to the margin of the body than to the parapodia.

The female, sketched from v. Willemoes Suhm's preparation, has a diameter of 2·2 mm., and the cirri, which are only preserved in part, measure ·27 mm. The preparation shows clearly the cup-like form of the suckers (S_1–S_4), the great breadth of the cloaca (*cl.*) and the mouth, and the extraordinarily developed pharynx. The bulbus musculosus of the pharynx (*ph.*) is 1·36 mm. long, and the free margin of the pharynx is covered by papillæ.

The male taken out of the same cyst (fig. 6) is shown in fig. 5. The interior organs, which are sketched in, were only to be seen on compressing the animal. The body is 1 mm. in length and rather stouter than in closely allied species, being thick and vaulted on the back, as in a specimen of *Myzostoma glabrum* of the same size, becoming, however, slightly transparent towards the border. The mouth (*m.*) and anal aperture (*a.*) are terminal; the pharynx (*ph.*) is not large; the twenty cirri are not longer than ·12 mm.; of these cirri the first and last pair are at a greater distance from those next to them, whereas the fifth and sixth are quite near together, enclosing the male genital aperture (♂). All that I saw of the testis appeared to show that instead of the compact organ of allied cysticolous forms, the organ retained the more primitive ramified character of the free-living Myzostomida.

The parapodia are stout and vigorous, and the hooks are correspondingly strong (·25 mm. in length). The suckers (*s.*) have the same form, arrangement, and relative size as those of the females. The male in v. Willemoes Suhm's preparation (fig. 2) is ·86 mm. long, and its cirri ·09 mm. long. The pharynx has a conspicuous circlet of papillæ.

It is an interesting fact that the malformations of the pinnules caused by this species sometimes combine with the arm-cysts of *Myzostoma tenuispinum*. I examined one compound cyst of this kind on *Antedon inæqualis*, P. H. C., and it may be seen from fig. 8, where it is displayed enlarged seven times, that the malformation of the pinnule is more striking than it is in the above-mentioned simple cysts of *Myzostoma willemoesii*. The basal portion alone, which represents nothing more than a lateral cavity of this portion of the arm, is inhabited by a pair of *Myzostoma tenuispinum;* it communicates by an aperture (fig. 8*B*) with the exterior, and is usually lined internally by a brownish membrane; it is separated from the part *b*, which is the malformed pinnule, by a calcareous partition passing in the direction of the arrow near *B*. In spite of its size, this part of the cyst contained only one pair of *Myzostoma willemoesii*. The ambulacral furrow is continued through the basal chamber *a* (fig. 8, *C*) into the chamber *b;* this last differs from the normal cysts of *Myzostoma willemoesii* (fig. 6), not only in the size of the pinnule joints, but also in that the interior slope of the joints (fig. 8, *C*) was much longer than the exterior; the margin also was prolonged into digitiform processes, covered with tubercles.

Host.—All the cysts were collected during the Challenger Expedition, and found on the following species of Crinoids:—

(*a*) *Antedon basicurva*, P. H. C. (No. 61), from Station 170 (Kermadec Islands). One individual had a single cyst on the proximal fifth of the arm. Another specimen out of the fourteen had a cyst of *Myzostoma tenuispinum*.

(*b*) *Antedon inæqualis*, P. H. C. (No. 62). Station 170 (Kermadec Islands). The specimen having four cysts of *Myzostoma tenuispinum*, had also one pinnule malformed by *Myzostoma willemoesii*. Station 174 (south-west of the Fiji Islands). A specimen with cysts of *Myzostoma tenuispinum* and also a combined cyst of this species and *Myzostoma willemoesii*.

66. *Myzostoma inflator*, n. sp. (Pl XV. figs. 1–4).

Fig. 1 represents a specimen of *Antedon angustiradia*, bearing at the commencement of two of the arms the cysts of this species. The cysts are pear-shaped, the thicker end being turned towards the disk and the thinner end being attached near the ambulacral furrow of the arms. The length of each cyst is about 3 mm., and they are connected with the arm along their whole length by a transparent delicate membrane. The wall of the cysts is hard and calcareous. In each cyst is a larger female individual and a smaller male, not unlike *Myzostoma murrayi;* in neither are the cirri or the suckers developed, and the female has no parapodia. From the opening of the cyst A the female projected slightly. In spite of its similarity to *Myzostoma murrayi* this species is evidently distinct; the female has a diameter about one-third less than the length; its contour is somewhat oblong, and the walls of the body are thin and delicate, so as to permit of the numerous intestinal cæca (fig. 3) and the ova being distinguished from the outside. The male (fig. 4) is provided like the female with a terminal mouth and anal aperture, and is similar in form. It differs from *Myzostoma murrayi*, not only in the structure of the intestinal canal, but also in the character of the testes, which are ramified through the whole body, after the manner of the free-living species, instead of being concentrated into a rounded and compact organ, as in *Myzostoma murrayi* and other cysticolous species; the genital openings also are not marginal but seem to be on the ventral side and further inwards than usual. I am unable to make any more exact statements, since the lateral portion of the specimen was rather injured, and also somewhat bent towards the ventral side. Some other specimens, from an *Actinometra* dredged at Barbados (Station 294 of the "Blake" Expedition), were in a better condition for examination. The cyst here was sausage-shaped, extending in a radial direction from the mouth to the border of the disk, about 3 mm. in length, and with a hard, rough wall. It was completely fused with the disk of its host throughout its whole extent

(fig. 2, *C*), and had a small aperture at the outer end. The most remarkable thing about this cyst was that, although undivided by any septum, it contained two pairs of *Myzostoma inflator*, which were closely pressed together and filled up the whole of the interior of the cyst. One pair was larger than the other, the female measuring 2·2 mm. in length by 1·2 mm. in breadth, and the male (fig. 4) ·9 mm. in length by ·8 mm. in breadth.

The relative length as well as the form of the hooks was the same in both sexes as in *Myzostoma murrayi* from *Antedon radiospina*.

Hosts.—(*a*) *Antedon angustiradia*, P. H. C., from Station 192 (south-west of Papua) of the Challenger Expedition.

(*b*) *Actinometra pulchella*, Pourt., sp., from Station 294 (Barbados) of the "Blake" Expedition.

67. *Myzostoma murrayi*, n. sp. (Pl. XV. figs. 5–13).

I found the peculiar cysts of this species first upon *Antedon duplex*, P. H. C., from St. Vincent (Station 269 of the "Blake" Expedition). There were upon the disk of this crinoid, quite close to the mouth, two club-shaped cysts, shown diagrammatically in fig. 8. The free end of the cyst projects between the arms on the dorsal side; the extremity is considerably thicker than the rest and bears an aperture. The larger of the two cysts measured 3·5 mm. long with a greatest diameter of ·86 mm., the width of the aperture being ·18 mm.; it was hanging down quite freely, whereas the smaller cyst was attached firmly to the disk for its whole length. The border of the cyst was tubercular, appearing to consist of numerous single calcareous plates united together by the solid membrane which lines the interior of the cyst. I had considerable difficulty in extracting the inhabitants of the cysts, and indeed only succeeded in getting some fragments from the larger one, since the parasites were very closely pressed into the various folds and furrows upon the inside of the cyst.

Mr. Carpenter, however, sent me a specimen of *Antedon radiospina* (Station 170, Challenger Expedition) containing two cysts of much larger size than the others. The first of these projected outwards and upwards from the ambulacral furrow at about the middle of the length of the arm; the second cyst was somewhat larger, placed in the same position on its host as the specimen from the "Blake" Expedition. This latter cyst is shown in fig. 9, *C*, magnified seven times; its length was 8 mm. Both these cysts were slightly connected along their whole length with the skin of the host. When the cyst was cut open lengthways, it was found to contain a female (fig. 10, ♀) which filled the distal two-thirds of the cyst, its dorsal surface being bent inwards; between the ventral surface of the female and the wall of the cyst, near the orifice, was a dwarf male (♂); the diameter of the body of the female, circular when fully stretched out, was 5·5 mm., its greatest thickness rather more than ·5 mm.; the whole body becomes thinner towards the margin, but is transparent throughout, and of a brownish colour. There was no trace of

suckers or parapodia visible, even by the help of a lens; the first are entirely absent and the latter are represented by a rudimentary hook-apparatus projecting but little beyond the surface of the body, and scarcely equalling in length the same structures in the male. Fig. 13 represents the manubrium (*ma.*) and the tip of a hook (*u.*) of the female, highly magnified; the obtuse form of the latter is remarkable, and is of course a sign of degeneration. Neither in the male nor in the female are any cirri present.

The male (fig. 11) is a thin transparent circular disk, 1·15 mm. in diameter by 1·3 mm. in length. The body of the female was quite full of eggs, which entirely prevented any minute examination into its structure; in the male the testes only occupy a small space on either side of the body, and do not conceal the other viscera. The genital aperture of one side (♂) is slightly withdrawn from the margin of the body; on the other side it is slightly prominent, and its margin is rather swollen. The alimentary tract is furnished with a terminal mouth and anus; the pharynx (*ph.*) is large and well developed, the rectum (*r.*) densely beset with fine long cilia; there are on either side three intestinal cæca (i_1–i_3), the terminal ramifications of which do not penetrate within the marginal border. Besides the pharyngeal valves, which are always present, there is another valve-like circular fold (*v.*), which divides the middle intestine into two parts. There are no suckers, but the parapodia (*p.*) are present as obtusely-pointed conical elevations, each enclosing a hook of ·2 mm. in length, which differs from that of the female in being pointed, and a manubrium ·15 mm. long. The cyst on the arm I did not open, as there appeared to be no doubt about its belonging to the same species.

Figs. 5 and 6 represent a stalked cyst from the disk of *Antedon angustiradia*, probably of this same species. It consisted of two hollow swellings separated by a groove; the stalk was solid. The whole length, including the stalk, was rather more than 5 mm. There was at the distal extremity a circular orifice with sharp edges. The structure of the wall was precisely as described in the other cysts, and only that side of the swelling which corresponded to the position of the opening was thinner and sufficiently transparent to allow of the large brown female being distinguished from the outside (fig. 5). It could also be seen through the aperture of the cyst. Its position within the cyst is shown diagrammatically in fig. 7; its form and structure, as far as I was able to judge, by help of the small fragments which I succeeded in getting out of the cyst, agreed with that of the female from *Antedon radiospina*, but the animal was hardly so large, its diameter being at the most 3·5 mm. In the same position as in *Antedon radiospina*, I found a dwarf male of the same form, but differing in the stronger curvature of the tips of the hooks.

Hosts.—(*a*) *Antedon angustiradia*, P. H. C., Station 192 (south-west of Papua) of the Challenger Expedition.

(*b*) *Antedon radiospina*, P. H. C., Station 170 (Kermadec Islands) of the Challenger Expedition.

(*c*) *Antedon duplex*, P. H. C., Station 269 (St. Vincent) of the "Blake" Expedition.

Stelechopus, n. gen.

The body is flat and long, the mouth at the anterior margin, the cloaca at the posterior; alimentary canal with no ramified cæca. Five parapodia on each side on the margin of the ventral surface, each one of which contains a fine long hook, and a supporting seta. The parapodia are entirely independent of each other, the parapodial muscles being very simple, and the radial musculi centrales, connected in the genus *Myzostoma* with a central muscular mass, are here absent. Instead of the radial muscular bundles (septa), there are numerous parallel muscular bundles joining the intestine to the body-wall. Suckers are wanting.

68. *Stelechopus hyocrini*, n. sp. (Pl. XVI. figs. 1–7).

The principal features in the organisation of this, the only species of *Stelechopus*, are stated in the generic definition. It appears to be undoubtedly the lowest form of Myzostomida, and ought therefore to decide the question concerning the affinities of the group with certain lowly organised Arthropoda (Tardigrada, Linguatulida). This affinity was formerly brought forward by me (Genus Myzostoma, p. 71), and I there proposed to unite the three groups into a single Class—Stelechopoda. It is therefore greatly to be regretted that the only specimens (nine individuals mounted in Canada balsam by v. Willemoes Suhm) which I received from Mr. Murray in November 1882, do not permit of an accurate study of the anatomy of this form. Any one having at his disposal abundant fresh material could undoubtedly render a great service to science.

Fig. 1 is a drawing which shows all that could be made out from all the different specimens; it is a combination figure. The specimen, however, from which the contour was drawn had been greatly squeezed, and the figure therefore does not give a right idea of the external form, and must be supplemented by a comparison with figs. 2–4.

The body when extended has a general similarity to a Tardigrade; the lateral margins are nearly parallel, and become somewhat narrowed at either end of the body. The anterior extremity is sometimes conical in form and highly prominent (fig. 1), sometimes retracted, and then looking as if truncated; the posterior extremity always projects as a conical caudal appendage (*CA*) between the last pair of parapodia. The largest specimen measured 3·5 mm. long with a greatest diameter of ·9 mm., the smallest was 1 mm. long and ·34 mm. broad. The caudal appendage of the former had a length of ·07 mm., of the latter ·06 mm. The body is flattened, and covered by a chitinous cuticle, reaching a thickness here and there of ·006 mm. in the largest specimen, highly refracting and yellowish in colour. Towards the mouth and cloaca, and at the end of the parapodia

(fig. 6), the cuticle becomes considerably thinner. Below the cuticle is a layer of polygonal epidermic cells from ·06–·01 mm. in breadth, and a muscular layer consisting of circular and longitudinal fibres. The circular fibres are extremely fine, and closely pressed together, whereas the longitudinal fibres are somewhat stronger, and separated by intervals. In specimens that have been but little squeezed, the integument is thrown into circular folds, sometimes interrupted by longitudinal folds, so that the surface is divided into ranks of large papillæ, which were especially well seen in a specimen (fig. 5) viewed with its dorsal side in profile, and in which the papillæ are of various sizes up to ·017 mm. in height. This system of folds is continued on to the parapodia, which are provided throughout their length from base to tip with circular concentric folds; the parapodia (fig. 2 *p.*) are not distinctly marked off from the body, and show no trace of any division into two portions, which is so typical of the Myzostomata; they arise from the extreme margin of the ventral side. The third pair are the most strongly developed, the first and the last are the most feeble. The first pair are obtusely conical in form, and about ·2 mm. long in the largest specimens; their breadth at the base is about ·28 mm. Corresponding to the insignificant size of the parapodia, the muscles and hook-apparatus (fig. 6) are but slightly developed; the latter consists of a long, thin (·25 mm. long ·006 mm. thick), straight hook (*u.*), with a short tip suddenly bent back, and of a slightly bowed, somewhat shorter but thicker supporting rod (*ma.*), which ends in a point, and shows no trace of any manubrial plate. The muscular apparatus is very simple; it consists of a fan-like series of fibres (*m.*), passing from the base of the parapodium and the integumental parts surrounding it to the base of the hook-apparatus, which they entirely envelope, serving no doubt as protractors. In no specimen, however, was the hook-apparatus stretched out, and indeed it was not generally even so prominent as in fig. 6, the extreme point alone being visible. Besides these protractor muscles are a series of radial fibres (m_2) passing to the end of the parapodium, and appearing to be joined partly to the supporting rod and partly to the integument at the end of the parapodium.

A third group of muscles passes from the end of the supporting bristle to the base of the hooks (m_1), and corresponds to the musculi conjunctores of the typical Myzostomata.[1] The most striking peculiarity in the condition of the parapodial muscles of *Stelechopus* is the absence of a musculus centralis,[2] which in *Myzostoma* is the most powerfully developed of all the muscles of the body, and combines with the musculi centrales of the other parapodia to form the central muscle-mass. There is nothing of the kind in *Stelechopus*, and the parapodial muscles are quite independent of each other. This arrangement is, without doubt, more primitive than the radial arrangement found in the typical Myzostomata, where the body is divided by radial septa into twelve sectors (ten for the parapodia, two for the pharynx and cloaca). Instead of this there are in

[1] Genus Myzostoma, pl. viii. fig. 1, *cb.* and *cl.*

[2] *Loc. cit.*, *mc.*

Stelechopus numerous parallel muscle bundles (fig. 1, *mm.*), reaching on both sides from the intestine to the integument. The intestine (*i.*) is more simple in structure, and there is no development of lateral diverticula; the entire alimentary canal is a simple tube (*i.*) passing through the body; it is frequently constricted, and at each constriction there is often a slight bulging out, but there is not any regularity to be observed in the arrangement of those bulgings; only in one individual (fig. 2) there was at the commencement a rudimentary diverticulum divided into three branches. The mouth is sometimes a small transverse slit, and sometimes a conspicuous round aperture of ·16 mm. diameter (fig. 3, *m.*), situated below the anterior margin of the body. It opens into a muscular tube, the pharynx (*ph.*), which does not, as it appears to do in fig. 1, pass directly into the intestine at its commencement, but opens into it some way behind from above, so that there is an anterior blind prolongation of the intestine. In none of the specimens did this pharynx project out of the mouth. With regard to the terminal part of the alimentary tract, I got no certain results; however, the tube which opens at the end of the caudal appendage would seem to be the cloaca, since the intestine appears to be continued into it, and I observed a mass of granular crumbling substance, which I believe to be fæces, projecting from it; also a muscular tube opens into it from above (*od.*), which must represent an oviduct, since there were a number of eggs visible in it. If this interpretation be right, then there is exactly the same relation between the rectum and the oviduct as in the genus Myzostoma. Mature ova are seen scattered through the body as oval or round bodies of ·06–·1 mm diameter, with a nucleus of ·03 mm. and a nucleolus of ·008 mm. in breadth (fig. 7). There are also to be found at the sides of the body, between the intestine and the integument, numerous accumulations of cells, which are distinctly different from the eggs by their granular appearance and smaller and variable size; these may serve as male genital cells. Since the specimens were not very well preserved, I can say nothing positive about these cells, neither have I succeeded in finding the male genital openings. It is possible, therefore, that the male sexual products find their way to the exterior by way of the cloaca, and it would be of the very greatest importance to clear up this point, which has special bearings upon the affinities of the group with the Tardigrada. This is all that I have been able to make out concerning the structure of this highly interesting form; too little, seeing its great importance, but sufficient to warrant its separation from the other Myzostomida.

Host.—Hyocrinus and *Bathycrinus*, off Crozet Islands, 1600 (Station 147) and 1375 fathoms, Challenger Expedition.[1]

[1] The label on the two preparations of v. Willemoes Suhm is "*Myzostomum* from *Hyocrinus*, 1600 fathoms, off Crozet Islands," but the passage in his sixth letter, which undoubtedly refers to these specimens, says :—"Ausser diesen gewöhnlichen Myzostomen gibt es übrigens auf Crinoiden noch andere allerdings mit diesen verwandte Parasiten, die ich im antarktischen Meer bei den Crozet-Inseln auf den aus 1375 Faden heraufgebrachten Gattungen Hyocrinus und Bathycrinus fand, Myzostomiden die ich einst daheim in Musse zu bearbeiten hoffe" (*Zeitschr. f. wiss. Zool.*, Bd. xxvi. p. lxxix.).

Finally, I must say that two specimens of *Myzostoma* which I had in my possession were so badly preserved that it was impossible for me to give an exact description of them, nor could I determine with any certainty their affinity with any of the described forms. The first was taken from *Antedon tuberosa*, P. H. C. (No. 92), dredged at Station 210 of the Challenger Expedition (Philippine Isles), the second from an *Antedon* also (No. 21), from Station 219 of the "Blake" Expedition; this last specimen had some likeness to *Myzostoma cirriferum*.

A third species, belonging to the Copenhagen Museum, was spoiled before I could examine it. It came from a small form of *Antedon* from Wladivostock (Russian Amurland).

LIST OF THE MYZOSTOMIDA HERE DESCRIBED, ARRANGED ACCORDING TO THE SOURCES WHENCE DERIVED.

(Those marked with an asterisk were only obtained from the source under which they are mentioned.)

Challenger Expedition.	Dredging Expedition of the U.S.S. "Corvin," "Bibb," "Hassler," and "Blake."
*Myzostoma horologium.**	*Myzostoma longipes.**
*labiatum.**	*testudo.**
echinus.	*marginatum.**
gigas.	*brevipes.**
*calycotyle.**	*areolatum.**
*compressum.**	*pictum.**
*wyville-thomsoni.**	*crenatum.*
*dentatum.**	*vastum.*
*fimbriatum.**	*agassizii.**
*fissum.**	*excisum.**
*intermedium.**	*irregulare.*
*quadrifilum.**	*caribbeanum.**
*quadricaudatum.**	*rotundum.**
*filiferum.**	*oblongum.**
*coronatum.**	*abundans.**
*folium.**	*elegans.*
*asymmetricum.**	*bicaudatum.**
*pentacrini.**	*filicauda.**
*deformator.**	*carinatum.*
*tenuispinum.**	*cysticolum.**
*willemoesii.**	*inflator.*
inflator.	*murrayi.*
murrayi.	
*Stelechopus hyocrini.**	
Total 24 (20).[1]	Total 22 (14).

[1] *i.e.*, Twenty-four species in all, twenty of which belong exclusively to the Challenger Expedition.

Prof. C. Semper.

Myzostoma costatum.
*pallidum.**
triste.
*dubium.**
*elongatum.**
*verrucosum.**
elegans.
*cornutum.**
*brachiatum.**
*lobatum.**

Total 10 (7).

Copenhagen Museum.

Myzostoma echinus.
*plicatum.**
gigas.
*lütkeni.**
triste.
*brevicirrum.**
irregulare.

Total 7 (3).

Kiel Museum.

*Myzostoma radiatum.**
cirriferum.
*moebianum.**
excisum.
*antennatum.**
carinatum.

Total 6 (3).

H.M.S. "Porcupine."

*Myzostoma alatum.**
gigas.
*pulvinar.**
cirriferum.

Total 4 (2).

British Museum.

Myzostoma triste.
*coriaceum.**

Cambridge (Mass.) Museum.

*Myzostoma nigrescens.**
crenatum.

H.M.S. "Triton."

*Myzostoma carpenteri.**
cirriferum.

Prof. E. Hæckel.

*Myzostoma rubrofasciatum.**
costatum.

Leyden Museum.

Myzostoma vastum.

"Willem Barents" Expedition.

Myzostoma gigas.

Norwegian Arctic Expedition.

Myzostoma gigas.

Mr. P. Herbert Carpenter.

Myzostoma cirriferum.

Prof. C. Th. v. Siebold.

Myzostoma costatum.

Dr. J. W. Spengel.

*Myzostoma chinesicum.**

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49. „ *fissum*, n. sp., ... 55
50. „ *intermedium*, n. sp., ... 55
51. „ *quadrifilum*, n. sp., ... 56
52. „ *quadricaudatum*, n. sp., ... 57
53. „ *lobatum*, Graff, ... 57
54. „ *bicaudatum*, n. sp., ... 57
55. „ *filicauda*, n. sp., ... 58
56. „ *filiferum*, n. sp., ... 59
57. „ *carinatum*, n. sp., ... 59
58. „ *coronatum*, n. sp., ... 60
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PLATE I.

PLATE I.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–17. *Myzostoma horologium*, n. sp.

Figs. 1, 2. The animal from the ventral side.

Fig. 3. Piece from a transverse section of the sucker. *cu.*, cutis; *dom.*, dorso-ventral muscles; *e.*, epithelium of the surface of the body; s_1., epithelium of the sheath of the sucker; *se.*, epithelium of the retracted sucker.

Figs. 4–14. Several variations in the pigmentation of the back.

Fig. 15. A hook from the parapodium.

Fig. 16. The supporting stalk, with its manubrium (*ma.*), the hook (*u.*) partly drawn.

Fig. 17. The supporting stalk after having been treated with alkali. The manubrium (*ma.*) and the outer layer of the stalk (*b.*) dissolved into a finely granular substance. The more resistent central part (*a.*) of the latter still preserved.

Figs. 18–24. *Myzostoma testudo*, n. sp.

Figs. 18, 19. Seen from the dorsal side, with the tubercles always in pairs, and the divided longitudinal elevation.

Figs. 20, 21. Seen from the ventral side.

Fig. 22. Diagrammatic cross section through fig. 19.

Fig. 23. A small individual with a somewhat different sculpturing of the back.

Fig. 24. Point of a hook-apparatus. *ma.*, manubrium of the supporting stalk; *u.*, the hook.

Figs. 25–29. *Myzostoma alatum*, Graff.

Fig. 25. The animal from the dorsal side.

Figs. 26, 27. The same from the ventral side.

Fig. 28. Diagrammatic cross section through fig. 27.

Fig. 29. Point of a hook-apparatus. *ma.*, manubrium of the supporting stalk; *u.*, the hook.

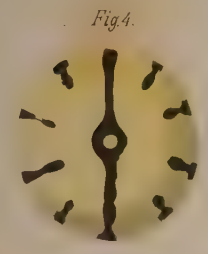
Fig. 4.

Fig. 5.

Fig. 1.

Fig. 9.

Fig. 10.

Fig. 6.

Fig. 7.

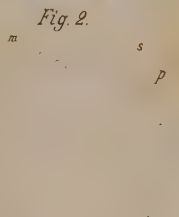
Fig. 2.
m
s
p

Fig. 11.

Fig. 12.

Fig. 8.

Fig. 15.

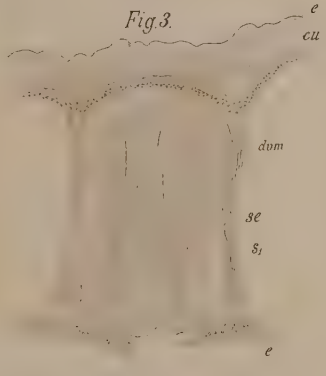
Fig. 3.
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e
cu
dvm
se
s_1
e

Fig. 13.

Fig. 16.
ma
u

Fig. 18.
a
b
c

Fig. 20.
m
ph
p
5

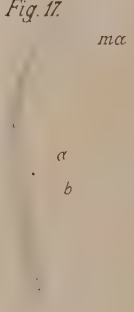
Fig. 17.
ma
a
b

Fig. 14.

Fig. 19.

Fig. 23.

Fig. 22.

cl

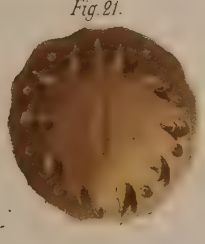
Fig. 21.

Fig. 28

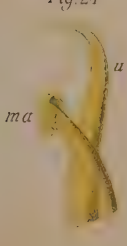
Fig. 24.
u
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Fig. 25.

Fig. 26
ph
5
p

Fig. 27.

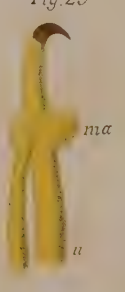
Fig. 29.
ma
u

Kunst v. Werner a. Winter, Frankfurt a. M.

1-17. Myzostoma horologium. 18-24. M. testudo. 25-29 M. ulatum

PLATE II.

PLATE II.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	*♂* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camer and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–8. *Myzostoma gigas*, Lütken, MS. (1–6, Copenhagen Museum, 7, 8, Challenger Expedition).

Figs. 1, 2. From the ventral side; magnified 5 diameters.
Fig. 3. From the dorsal side; magnified 5 diameters.
Figs. 4–6. Its hook-apparatus. In fig. 4 the manubrium of the supporting stalk has been detached by the effect of the alkali; its outer layer (*b*) is stripped off, whereas the axis *a.* is intact.
Figs. 7, 8. Young individuals; magnified 7 diameters.

Fig. 9. *Myzostoma carinatum*, n. sp.

Fig. 9. The animal, seen from above (*B*) and from below (*A*).

Figs. 10–15. *Myzostoma carpenteri*, Graff.

Figs. 10, 11. The larger individual, seen from the dorsal and ventral side.
Fig. 12. Marginal cirri of the smaller individual.
Fig. 13. Marginal part of the larger individual.
Fig. 14. Diagrammatic cross section through fig. 10.
Fig. 15. Young stage attached to the back of fig. 10 (camera).

Figs. 16–19. *Myzostoma marginatum*, n. sp.

Fig. 16. From the dorsal side.
Figs. 17, 18. From the ventral side.
Fig. 19. Diagrammatic cross section.

Figs. 20, 21. *Myzostoma lütkeni*, n. sp.

Figs. 20, 21. The animal, seen from the ventral side.

Fig. 22. *Myzostoma pictum*, n. sp.

Fig. 22. The animal, seen from the dorsal side; magnified 16 diameters.

Fig. 23. *Myzostoma labiatum*, n. sp.

Fig. 23. The fore-end highly magnified, in order to show the papillæ of the mouth border (*mp.*).

Figs. 24–28. *Myzostoma longipes*, n. sp.

Fig. 24. From the dorsal side.
Figs. 25, 26. From the ventral side.
Fig. 27. Diagrammatic cross section through fig. 24.
Fig. 28. A complete hook-apparatus.

Figs. 29, 30. *Myzostoma echinus*, n. sp.

Fig. 29. Seen from the side.
Fig. 30. Seen from the ventral side.

Both figures show the radial ranks of hard prickle-like tubercles of the skin.

Fig. 31. *Myzostoma chinesicum*, n. sp.

Fig. 31. The animal, seen from the dorsal side; magnified 6 diameters.

Fig. 32. *Myzostoma rubro-fasciatum*, n. sp.

Fig. 32. The animal, seen from the dorsal side.

1. v. Graff del.

Lith. Anst. v. Werner & Winter, Frankfurt a. M.

1. *Myzostoma stigas*. 9. *M. canadense*. 10. 11. *M. carpenteri*. 12. 13. *M. australiense*. 20. 21. *M. bilobatum*. 22. *M. pictum*. 23. *M. subpictum*. 24–28. *M. longipes*. 29–30. *M. echinus*. 31. *M. chinesicum*. 32. *M. rubrofasciatum*.

PLATE III.

PLATE III.

In all the Plates the following letters have the same signification.

c Marginal cirrus.	*p.* Parapodium.
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m. Mouth.	*t.* Testicle.
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ov. Ovarium.	*♂* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–3. *Myzostoma areolatum*, n. sp.

Fig. 1. From the dorsal side; magnified 60 diameters.

Fig. 2. From the ventral side.

Fig. 3. Diagrammatic cross section.

Figs. 4–8. *Myzostoma compressum*, n. sp.

Fig. 4. Part of the hook-apparatus.

Fig. 5. The animal seen from the side.

Fig. 6. Seen from above.

Fig. 7. Diagrammatic cross section.

Fig. 8. Part of the hook-apparatus.

Fig. 9. *Myzostoma coronatum*, n. sp.

Fig. 9. The animal, seen from above (*C*), and from the ventral side (*A* and *B*).

Figs. 10, 11. *Myzostoma folium*, n. sp.

Fig. 10. The animal, seen from the dorsal side (*C*), from below (*A* and *B*).

Fig. 11. Point of a hook.

Fig. 12. *Myzostoma radiatum*, n. sp.

Fig. 12. The animal, seen from below (*A*), and in diagrammatic cross section (*B*).

Figs. 13–15. *Myzostoma nigrescens*, n. sp.

Fig. 13. The animal seen from above, with one marginal border turned up.

Fig. 14. Hook-apparatus.

Fig. 15. An abnormal cirrus.

Figs. 16–18. *Myzostoma plicatum*, n. sp.

Fig. 16. From above.

Fig. 17. From below.

Fig. 18. Diagrammatic cross section; magnified 8–9 diameters.

Figs. 19, 20. *Myzostoma brevipes*, n. sp.

Fig 19. Two individuals *in situ*.

Fig. 20. Diagrammatic cross section.

Figs. 21–23. *Myzostoma pulvinar*, Graff.

Fig. 21. From above.

Fig. 22. From below.

Fig. 23. Point of a hook-apparatus protruded from the parapodium.

Figs. 24–26. *Myzostoma calycotyle*, n. sp.

Fig. 24. The animal, seen from the dorsal side; magnified 15 diameters.

Fig. 25. The same, from the ventral side; magnified 7 diameters. *a.* and *b.* the foremost pair of parapodia.

Fig. 26. A parapodium and a sucker highly magnified.

1-3. Myzostoma areolatum. 4-8. M. compressum. 9. M. coronatum. 10-11. M. folium. 12. M. radiatum. 13-15. M. nigrescens. 16-18. M. plicatum. 19-20. M. brevipes. 21-23. M. pulvinar. 24-26. M. calycocotyle.

PLATE IV.

PLATE IV.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Fig. 1. *Myzostoma fissum*, n. sp.

Fig. 1. The animal seen from the dorsal side.

Fig. 2. *Myzostoma intermedium*, n. sp.

Fig. 2. Outline only. *C* the last pair of cirri; CA_1-CA_3, the caudal appendages.

Figs. 3–6. *Myzostoma quadrifilum*, n. sp.

Figs. 3, 4. Two individuals, seen from the ventral side.

Figs. 5, 6. Marginal cirri of another individual, more highly magnified; seen from above (6), and from below (5).

Fig. 2.

Fig. 1.

Fig. 5.

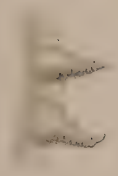


Fig. 6.

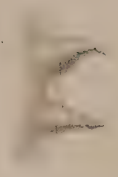
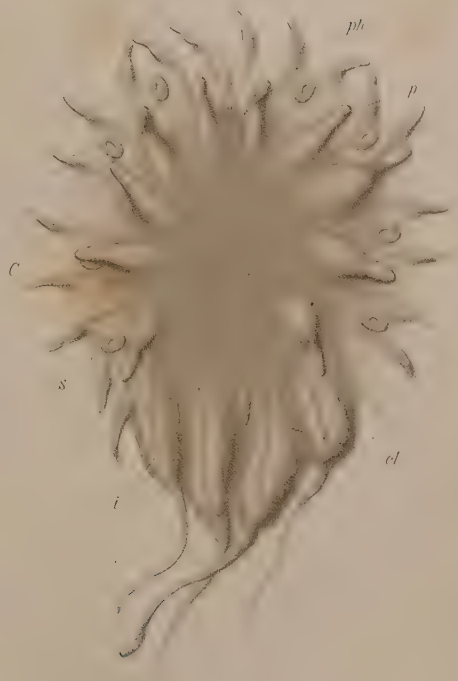


Fig. 4.



L. v. Graff fec

Lith. Anst. v. Werner & Winter, Frankfurt a/M.

1. *Myzostoma fissum.* 2. *M. intermedium.* 3–6. *M. quadrifilum.*

PLATE V.

PLATE V.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	*♂* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Fig. 1. *Myzostoma filiferum*, n. sp.

Fig. 1. The animal, seen from the side, with the terminal threads (*CF.*) of the caudal appendages.

Figs. 2, 3. *Myzostoma bicaudatum*, n. sp.

Fig. 2. From the ventral side, with the obtuse caudal appendages (*CA*).

Fig. 3. The point of a hook.

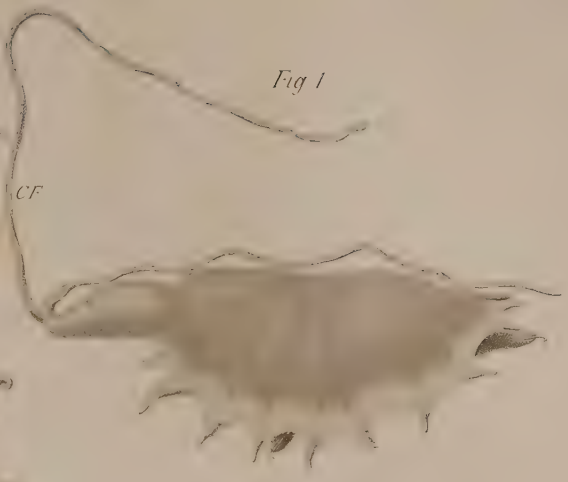
Fig. 4. *Myzostoma filicauda*, n. sp.

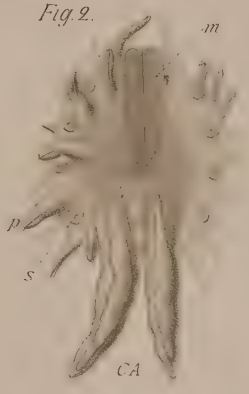
Fig. 4. The animal, seen from the ventral side, with the long caudal appendages (*CA*), and the short terminal threads (*CF.*). One of the caudal appendages was broken off, and is, like the point of the terminal thread *CF.*, hypothetically restored. In the same way the broken cirri in figs. 2 and 5 are restored. (The restored parts are distinguished by a lighter tint.)

Figs. 5, 6. *Myzostoma quadricaudatum*, n. sp.

Fig. 5. The animal, seen from the ventral side.

Fig. 6. The point of a hook.





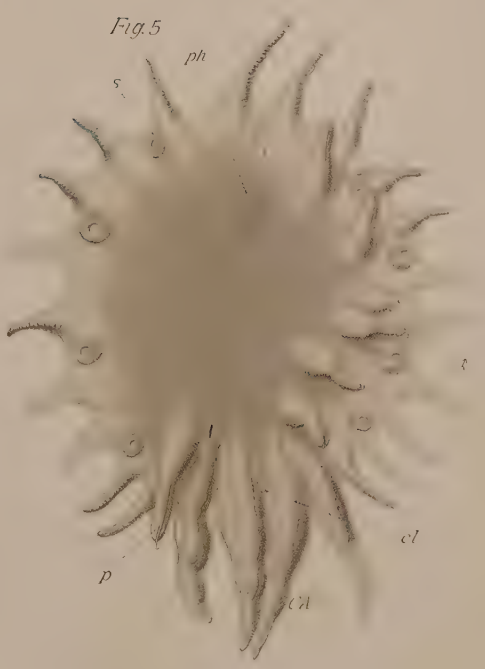


Fig 6

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1 Myzostoma filiferum. 2-3. M. bicaudatum. 4 M. filicauda. 5-6. M. quadricaudatum.

PLATE VI.

PLATE VI.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	*δ* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1, 2. *Myzostoma wyville-thomsoni*, n. sp.

Fig. 1. The animal, seen from the ventral side.

Fig. 2. The point of a hook, much magnified.

Figs. 3, 4. *Myzostoma brevicirrum*, n. sp.

Fig. 3. The animal, seen from the ventral side.

Fig. 4. Hook-apparatus.

Figs. 5, 6. *Myzostoma fimbriatum*, n. sp.

Fig. 5. A piece of the hind border, with cirri (*C.*) and fringes (*a.*).

Fig. 6. Some of these fringes more highly magnified.

Fig 4

Fig 1

Fig 2

Fig 3

Fig 6

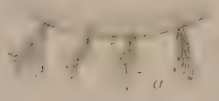


Fig 5

Lith. Anst. v. Werner & Winter, Frankfurt a/M.

1-2. *Myzostoma Wyville-Thomsoni*. 3 4. *M. brevicirrum*. 5 6. *M. fimbriatum*.

PLATE VII.

PLATE VII.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Fig. 1. *Myzostoma agassizii*, n. sp.

Fig. 1. Marginal border turned inward to the ventral side.

Figs. 2, 3. *Myzostoma vastum*, n. sp.

Fig. 2. Animal seen from the ventral side, only half drawn.

Fig. 3. An abnormal cirrus.

Fig. 4. *Myzostoma crenatum*, n. sp.

Fig. 4. The animal, seen from the ventral side.

Fig 3

Fig 1

Fig 2

Fig. 4.

Lith. Anst. v. Werner & Winter, Frankfurt a/M

1. *Myzostoma Agassizii*. 2-3. *M. vastum*. 4. *M. crenatum*.

PLATE VIII.

PLATE VIII.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Fig. 1. *Myzostoma antennatum*, n. sp.

Fig. 1. The outline of the animal restored by help of fragments, and the lost cirri completed.

Fig. 2. *Myzostoma excisum*, n. sp.

Fig. 2. The animal, seen from the ventral side.

Figs. 3–10. *Myzostoma mœbianum*, n. sp.

Fig. 3. The whole animal, seen from the ventral side.

Fig. 4. The anterior extremity with protruded pharynx.

Fig. 5. Ciliated cells of the rectum.

Fig. 6. Reddish cells in the stomach and intestinal branches.

Fig. 7. Marginal cirrus, much magnified.

Fig. 8. Cells of the skin, seen from the surface.

(Figs. 3–8 are from sketches by Prof. Möbius.)

Figs. 9, 10. Two hook-apparatuses, drawn from a preparation of Prof. Möbius.

Fig. 3

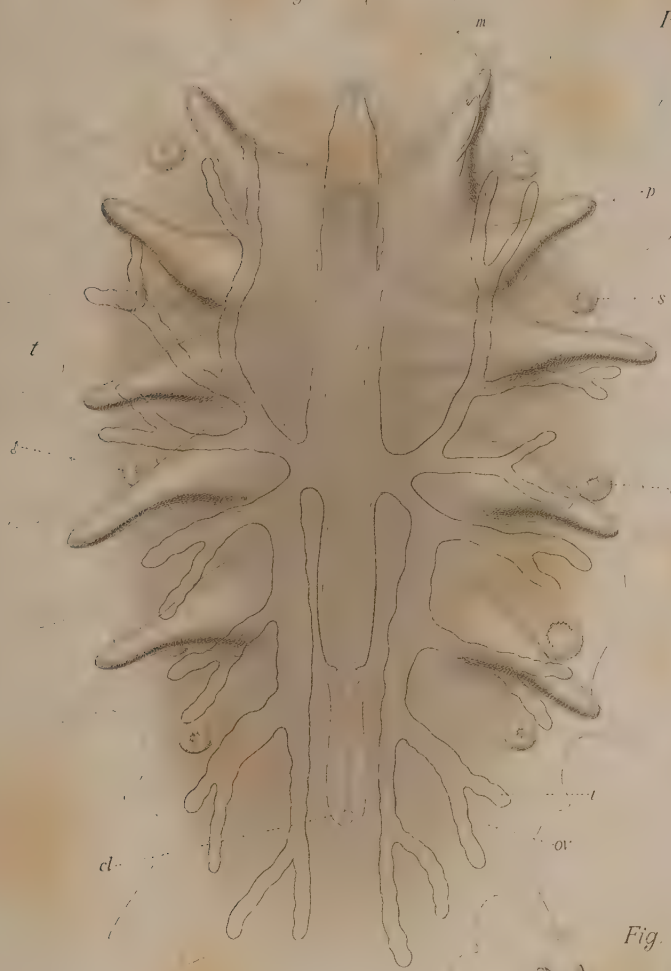


Fig. 4.

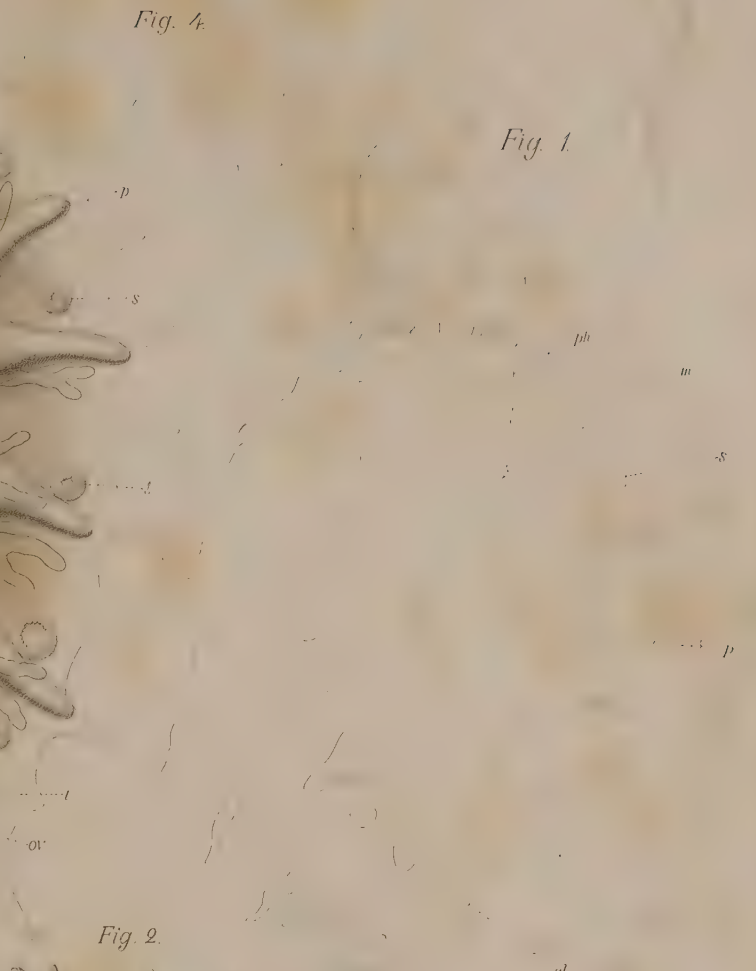


Fig. 1.

Fig. 2.

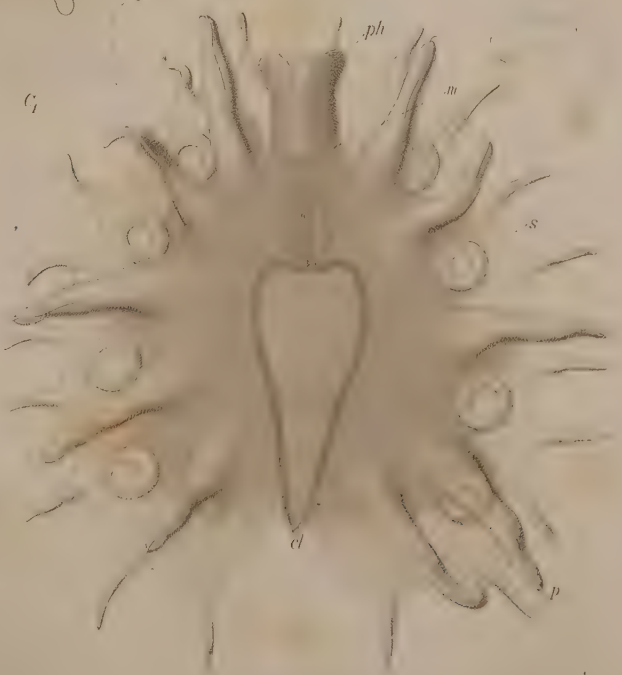


Fig. 9.

Fig. 10.

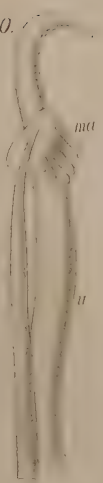


Fig. 5

Fig. 6

Fig. 7.

Fig. 8.

PLATE IX.

PLATE IX.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*w.* Hook of the hook-apparatus.
ov. Ovarium.	♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Fig. 1. *Myzostoma dentatum*, n. sp.

Fig. 1. The animal, seen from the ventral side. C and C_1, unpaired median cirri.

Figs. 2–5. *Myzostoma irregulare*, n. sp.

Figs. 2–5. All the figures represent only one-half of the animal, with or without median cirri C and C_1.

Fig 1

Fig. 2.

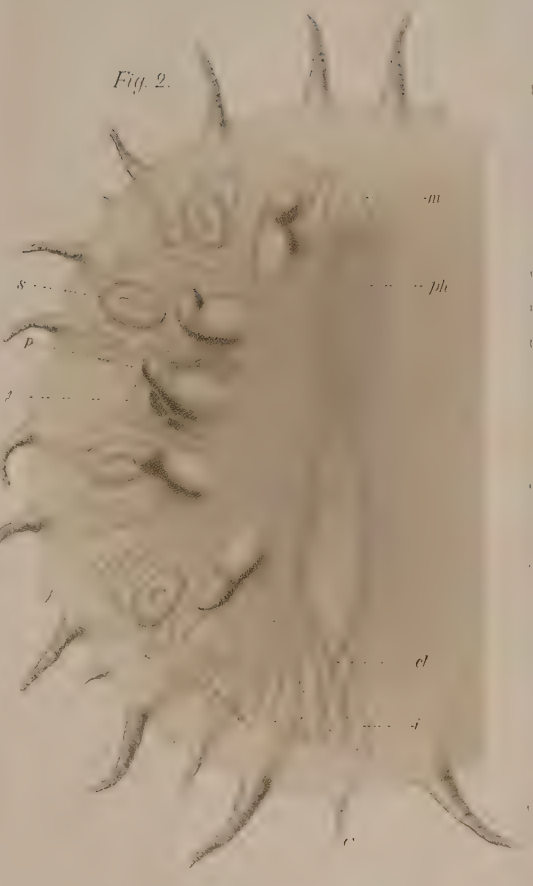


Fig. 3

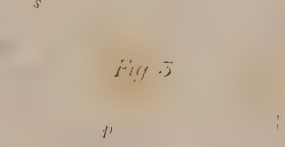
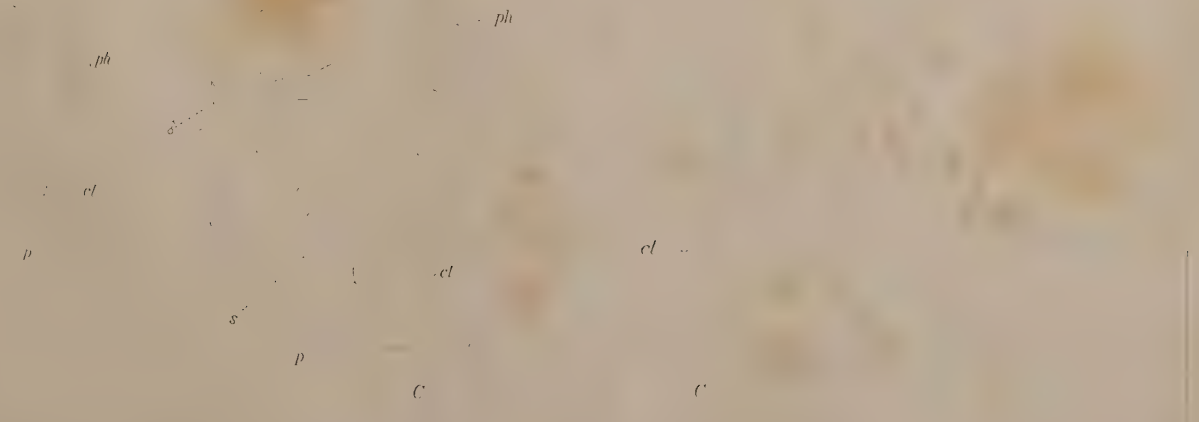


Fig. 4.

Fig 5.



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1. Myzostoma dentatum. 2-5. M irregulare.

PLATE X.

PLATE X.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	*♂* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Fig. 1. *Myzostoma abundans*, n. sp.

Fig. 1. The animal, seen from the ventral side; only half drawn.

Fig. 2. *Myzostoma rotundum*, n. sp.

Fig 1. The animal, seen from the ventral side.

Fig. 3. *Myzostoma oblongum*, n. sp.

Fig. 3. The animal, seen from the ventral side; only half drawn. The hind part of the body was quite destroyed, and is, as well as the last four cirri, hypothetically restored.

Fig. 4. *Myzostoma caribbeanum*, n. sp.

Fig. 4. The animal, seen from the ventral side; only half drawn.

Fig. 1

Fig. 2.

Fig. 3.

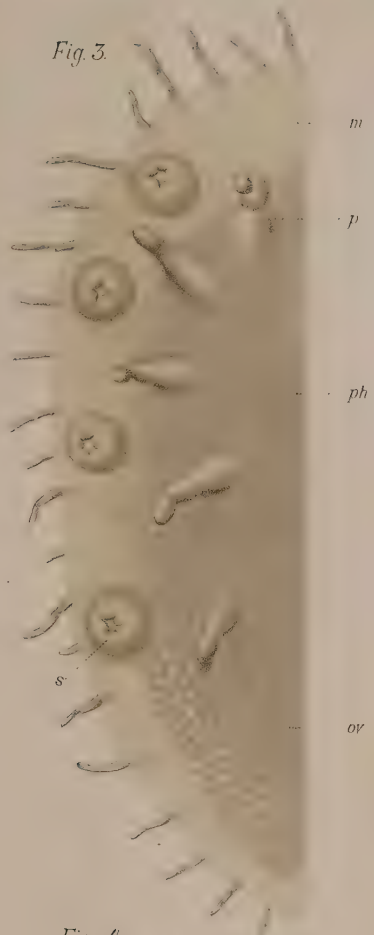

Fig. 4

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1. Myzostoma abundans. 2. M. rotundum. 3. M. oblongum. 4. M. Caribbeanum.

PLATE XI.

PLATE XI.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	*♂* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–3. *Myzostoma coriaceum*, n. sp.

Figs. 1, 2. The animal, seen from the ventral side.

Fig. 3. A diagrammatic cross section.

Figs. 4–8. *Myzostoma asymmetricum*, n. sp.

Fig. 4. Portion of an arm of *Pentacrinus alternicirrus*, P. H. C., magnified. From the dorsal side (*A*), and from the side (*B*), in order to show the swelling of the arm and the two pinnules (*) enlarged by the *Myzostoma*.

Fig. 5. The same without the pinnules of one side, to show the base of an enlarged pinnule, which base bears the *Myzostoma*.

Fig. 6. This pinnule from the side (*B*), and in cross section (*A*), in order to show the groove where the *Myzostoma* lay in contact with it.

Fig. 7. The *Myzostoma* from the ventral side; magnified about 28 diameters. In this figure the letters *p* and *ph* have been interchanged.

Fig. 8. Diagrammatic cross section through this *Myzostoma*.

Figs. 9–15. *Myzostoma pentacrini*, n. sp.

Fig. 9. Thickened portion of an arm of *Pentacrinus alternicirrus*, P. H. C. Seen from both sides (*A*, *B*), and from the dorsal side (*C*). The arm-joints *a-e* participate in the swelling. In *B* the *Myzostoma*, lying in a cyst, can be seen through the aperture in the joint *c*.

Fig. 10. The arm divided in the direction of the arrow (fig. 9, *C*), seen from the distal end. The two chambers, containing each a *Myzostoma*, are separated by a strong septum.

Fig. 11. The half of a squeezed preparation made by v. Willemoes Suhm to show the intestinal ramifications (*i*).

Fig. 12. The animal (fig. 9), seen from the dorsal side.

Fig. 13. The same, from the ventral side; magnified about 16 diameters.

Fig. 14. Cross section through another specimen.

Fig. 15. Another swelling of an arm of a *Pentacrinus* not so much magnified.

Fig. 4.

Fig. 1.

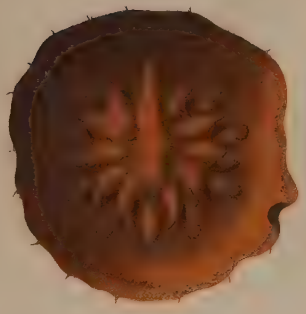


Fig. 8.

Fig. 7.

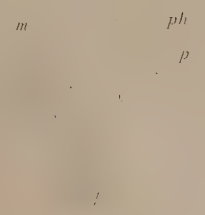


Fig. 2.

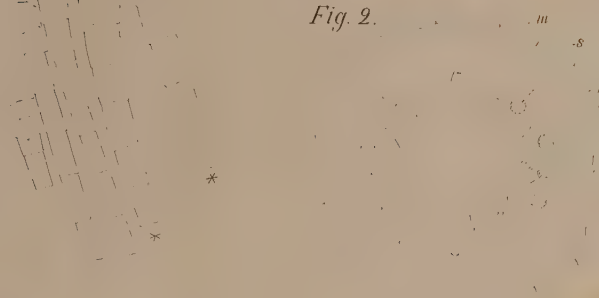


Fig 3

Fig. 5.

Fig. 6.

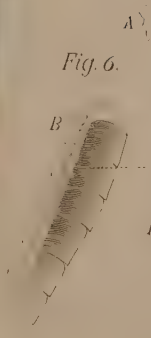
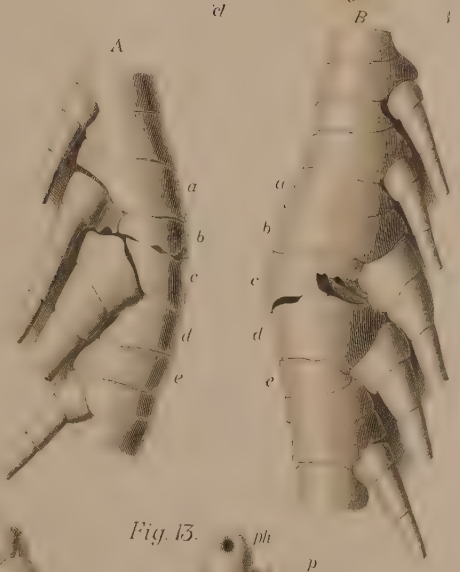


Fig. 15.

Fig. 9.



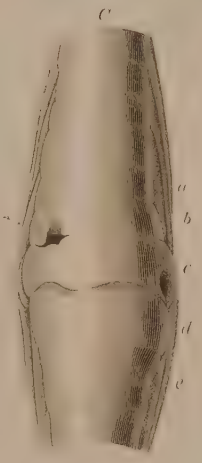


Fig. 11.

Fig. 12.

Fig. 13.

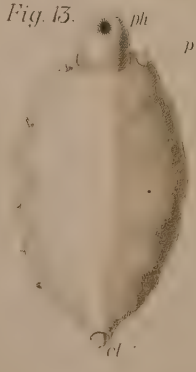


Fig. 14

Fig. 10.

Lith. v. Werner & Winter, Frankfurt a/M.

1-3. *Myzostoma coriaceum.* 4-8. *M. asymmetricum.* 9-15. *M. pentacrini.*

PLATE XII.

PLATE XII.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.
cl. Cloacal papilla or opening.
i. Intestine.
m. Mouth.
ma. Manubrium of the supporting stalk of the hook-apparatus.
ov. Ovarium.
p. Parapodium.
ph. Pharynx.
s. Sucker.
t. Testicle.
u. Hook of the hook-apparatus.
♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–9. *Myzostoma deformator*, n. sp.

Fig. 1. The animal, magnified 5 diameters; seen from the dorsal side (*A*), and from the ventral side (*B*).

Figs. 2, 3. A swollen pinnule of *Pentacrinus alternicirrus*, P. H. C., from both sides. The arrow shows the direction of the internal septum; * is the injured pinnule lying opposite to the malformed one.

Figs. 4–6. Another malformed pinnule of *Pentacrinus alternicirrus*, P. H. C., from both sides, and broken open (5) to show the septum. Here also the three arm-joints *a*-*c* share in the swelling.

Fig. 7. A cross section through the *Myzostoma* in the hinder half of the body.

Fig. 8. A cross section about the middle of the body (camera, objective 0). *dvm.*, dorso-ventral muscular bundles; *e.*, epithelium of the surface of the body; *mc.*, musculus centralis of the hook-apparatus; *n.*, brain; n_1, nerves cut across; *od.*, oviduct; *st.*, middle intestine ("stomach").

Fig. 9. Isolated eggs of the ovarium. *a*, unripe, *b*, ripe ones (camera, objective IV.).

Fig. 1

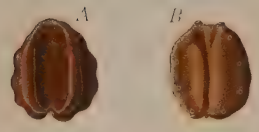


Fig. 2.

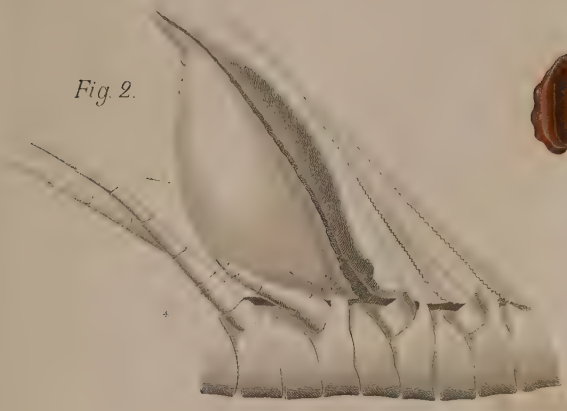


Fig. 3

Fig. 4.

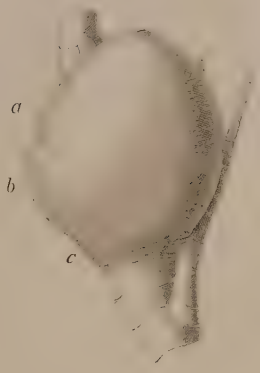


Fig 5

Fig 6.

Fig 9

Fig. 7.

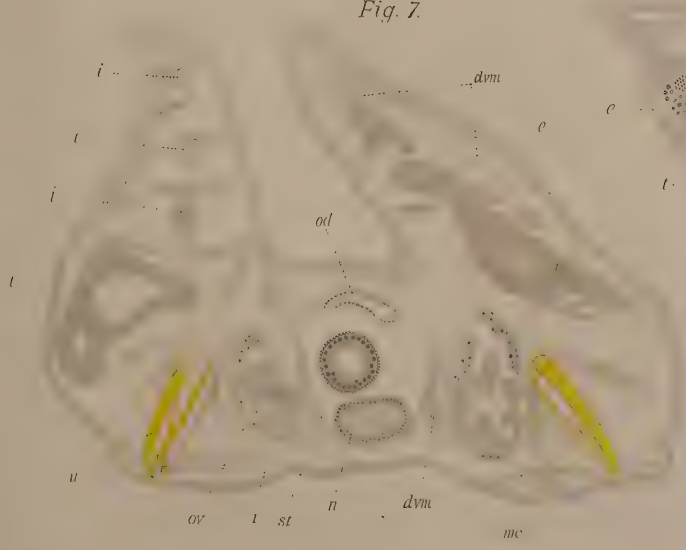


Fig. 8.

L v Graff fec

Lith. Anst v Werner & Winter, Frankfurt a/M.

1-9. Myzostoma deformator.

PLATE XIII.

PLATE XIII.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–5. *Myzostoma cysticolum*, n. sp.

Figs. 1–3. Three cysts from *Actinometra meridionalis*, var. *carinata*, P. H. C.; magnified 5 diameters (figs. 1 and 3 drawn from both sides).

Fig. 4. Cross section through such a cyst, containing a dwarf male (♂) and the large female (♀). This latter is folded together, so that the lateral parts, lying quite close together, enclose a canal which serves as a "brood pouch" for the eggs.

Fig. 5. The dwarf male, seen from the ventral side; magnified about 75 diameters.

Figs. 6–16. *Myzostoma tenuispinum*, n. sp.

Fig. 6. A cyst from *Antedon inæqualis*, P. H. C.; magnified 7 diameters. From both sides (*A*, *B*), and broken open (*C*), to show the male and the female within.

Fig. 7. The dwarf male, from the ventral side; magnified about 75 diameters. *r.*, the rectum.

Fig. 8. The female, from the ventral side; magnified about 12 diameters.

Fig. 9. Diagrammatic cross section of the same.

Fig. 10. Diagrammatic longitudinal section of the same; the upper is the dorsal surface.

Figs. 11–14. Four other cysts from *Antedon inæqualis*, P. H. C.; magnified $2\frac{1}{2}$ diameters (14, *A*, from the side and *B*, from the dorsal side).

Fig. 15. A large cyst upon the base of an arm of *Antedon angusticalyx*, P. H. C., in three different views, magnified 7 diameters, having a main aperture (*x*) and two secondary apertures (*y*, *z*).

Fig. 16. An arm cyst of *Antedon incisa*, P. H. C., twice enlarged (copy of a figure made by Dr. P. H. Carpenter, and published here with his permission).

1-5. Myzostoma cysticolum. 6-16. M. tenuispinum.

PLATE XIV.

PLATE XIV.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	*♂* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–8. *Myzostoma willemoesii*, n. sp.

Figs. 1, 2. Outlines of the female and of the dwarf male, from a preparation by v. Willemoes Suhm (camera, objective 0).

Figs. 3, 4. The female from the cyst fig. 6, magnified about 15 diameters; from the dorsal (fig. 3); and from the ventral side (fig. 4).

Fig. 5. The male belonging to it; magnified 75 diameters. On the left side the suckers, and on the right side the parapodia (from the second to the fifth) not drawn.

Fig. 6. Malformed pinnule of *Antedon inæqualis*, P. H. C.; magnified 5 diameters.

Fig. 7. The first three joints of this pinnule drawn from both sides.

Fig. 8. Another malformed pinnule of *Antedon inæqualis*, P. H. C., attached to the arm-joint *a* (also malformed). In this is contained a pair of *Myzostoma tenuispinum*, in the cyst of the pinnule *b* a pair of *Myzostoma willemoesii*, and both separated by a septum in the direction of the arrow; magnified 7 diameters.

Fig 1

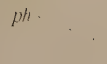


Fig. 3.

Fig 4

Fig 2.

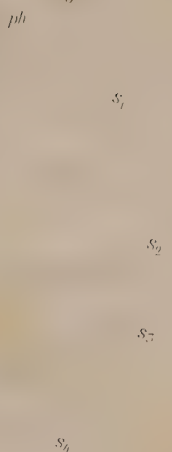


Fig 5.

Fig 8

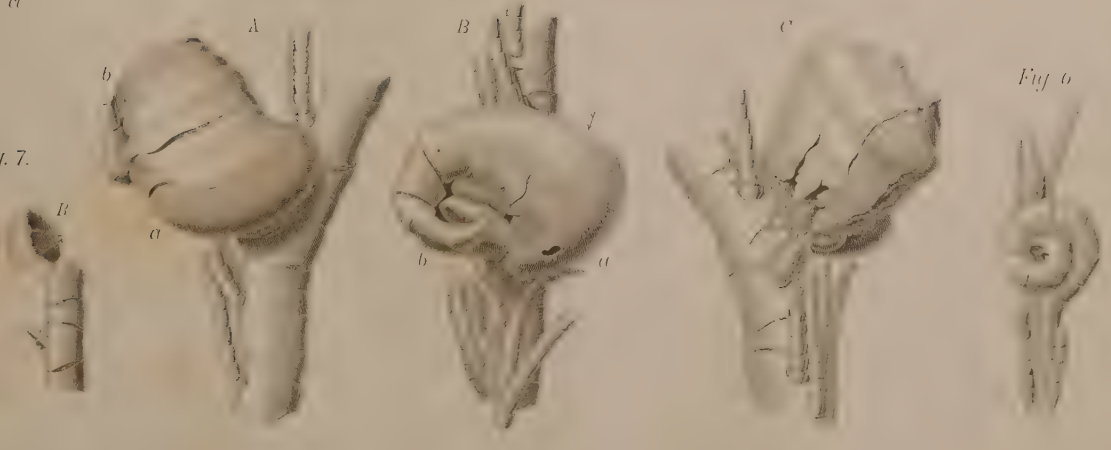


Fig. 7.

Fig 6

PLATE XV.

PLATE XV.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	*δ* Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–4. *Myzostoma inflator*, n. sp.

Fig. 1. Disk of *Antedon angustiradia*, P. H. C. (*a.*, anal tube; *m.*, mouth), with two cysts *A* and *B* at the base of the arm; magnified about 6 diameters.

Fig. 2. Disk of *Actinometra pulchella*, Pourt., sp., with a fixed cyst (*C*) not so much magnified.

Fig. 3. Intestinal ramification of the female from the cyst (fig. 2).

Fig. 4. Dwarf male from the cyst (fig. 2), from the ventral side; magnified 75 diameters. *r.*, rectum.

Figs. 5–13. *Myzostoma murrayi*, n. sp.

Figs. 5, 6. Stalked cyst from the disk of *Antedon angustiradia*, P. H. C., from both sides; magnified 5 diameters.

Fig. 7. Diagrammatic cross section through this cyst, to show the position of the female (♀).

Fig. 8. Cyst upon *Antedon duplex*, P. H. C., about twice enlarged. *C* the *Myzostoma* cyst.

Fig. 9. Cyst (*C*) upon *Antedon radiospina*, P. H. C.; magnified about 7 diameters.

Fig. 10. Diagrammatic cross section through the latter, to show the male (♂) and the female (♀) within.

Fig. 11. The male 75 times enlarged. *v.*, valve-like circular fold between middle and terminal intestine; *r.*, rectum.

Fig. 12. A hook-apparatus slightly enlarged.

Fig. 13. The point of the hook-apparatus much enlarged.

Fig. 1

Fig. 2

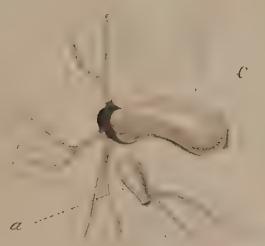
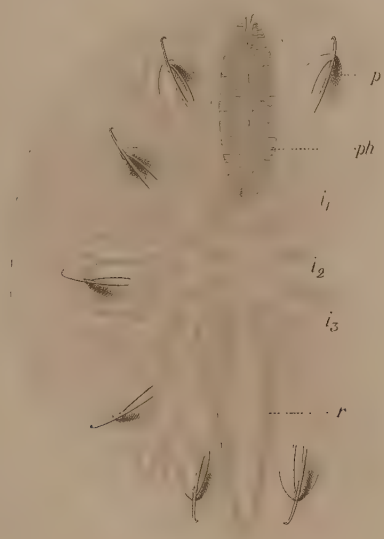


Fig. 3.

Fig. 4.



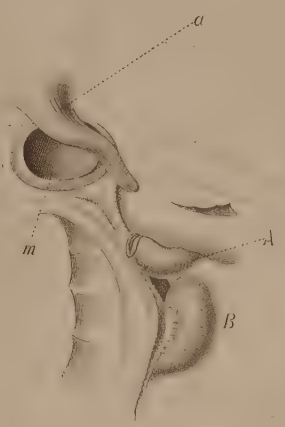


Fig. 8.

Fig. 10.

Fig. 11.

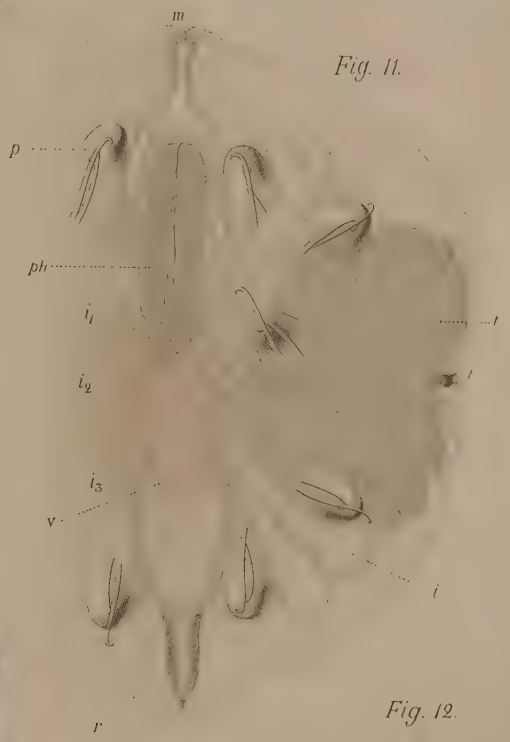


Fig. 5

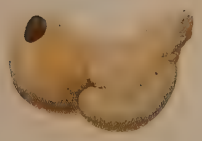


Fig. 7.

Fig. 9.

Fig. 6.

Fig. 12.

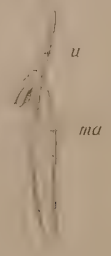
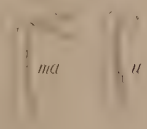


Fig. 13.



L. v. Graff fec

Lith. Anst. v. Werner & Winter, Frankfurt a/M.

1-4. Myzostoma inflator. 5-13. M. murrayi.

PLATE XVI.

PLATE XVI.

In all the Plates the following letters have the same signification.

c. Marginal cirrus.	*p.* Parapodium.
cl. Cloacal papilla or opening.	*ph.* Pharynx.
i. Intestine.	*s.* Sucker.
m. Mouth.	*t.* Testicle.
ma. Manubrium of the supporting stalk of the hook-apparatus.	*u.* Hook of the hook-apparatus.
ov. Ovarium.	♂ Male genital papilla or opening.

Note.—The coloured drawings show the object seven times magnified; the uncoloured drawings are drawn with the Oberhäuser camera and objective 0 (Seibert and Krafft), which magnifies 40 diameters, the hook-apparatus with camera and objective IV., which magnifies 220 diameters, if the contrary be not expressly stated.

Figs. 1–7. *Stelechopus hyocrini*, n. gen. and n. sp.

Fig. 1. Combined from several sketches (camera, objective 0). *CA*, caudal appendage; *mm.*, parallel muscular bundles passing from the integument to the intestine.

Fig. 2. Fore part of the body, the mouth retracted, seen from the ventral side (camera, objective 0).

Fig. 3. Extended fore-end of another individual.

Fig. 4. Hind-end of the smallest individual, with the last two pairs of parapodia, and the caudal appendage (*CA*) (camera, objective 0).

Fig. 5. Profile view of the back, with its skin divided by longitudinal and cross furrows into flat papillæ.

Fig. 6. A parapodium with its muscle mass much enlarged (camera, objective 0). *cu.*, cuticule; *m.*, m_1., m_2., muscles of the hook-apparatus.

Fig. 7. A ripe egg (camera, objective IV.).

Fig. 1.

Fig. 2.

Fig. 3.

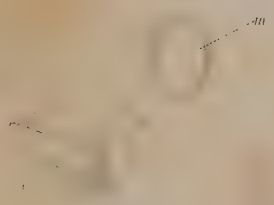


Fig. 4.

Fig. 5.

Fig. 6.

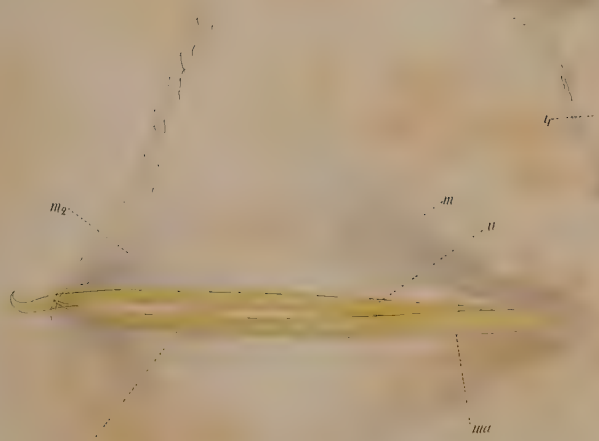


Fig. 7.

Case 3.
Shelf F
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